MARINE PRODUCTS EQUIPMENT GUIDE

Volume III

ERL COMMERCIAL MARINE INC.

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ERL MISSION STATEMENT

Electromechanical Research Laboratories was founded in 1970 with a simple mission, to follow the Golden Rule. Simply stated, it is to treat others in the way that we want to be treated. This simple rule continuously guides our behavior toward our customers, our employees, and our vendors.

FOREWORD

Dear Marine Industry Associate:

ERL Commercial Marine, Inc. is proud to provide you with our third edition of our Marine Equipment Guide. We hope you will find this book to be a valuable reference tool that you will want to use often.

Since the founding of ERL, Inc. in 1970, by Dr. Larry Wilkins, our company has been guided by old fashioned values and today's leading technology. We maintain our old fashion values producing quality products, service, and integrity in customer relations along with high tech design regarding engineering, testing and manufacturing methods. Our 46,000 square foot manufacturing facility produces equipment ready for the demanding marine workplace environment. It all adds up to VALUE for you.

Everyone at ERL, Inc. appreciates your business. We thank you for allowing us to install ERL marine equipment on over 10,000 of your liquid cargo compartments! The positive evolution of our equipment is a continuing effort. We want to know what we can do to service you better. If you have comments or questions concerning this book or any of the products listed, please do not hesitate to call.

Thank you!

Sincerely,

Dr. Larry C. Wilkins
President

Stephen Wilkins
VP/Design Engineer

Todd Marshall
Plant Manager

Ryan C. Waiz, PE
Design Engineer

Tim Swinney
Mark Matheny
Sales

Dale Popp
Production/Quality Assurance

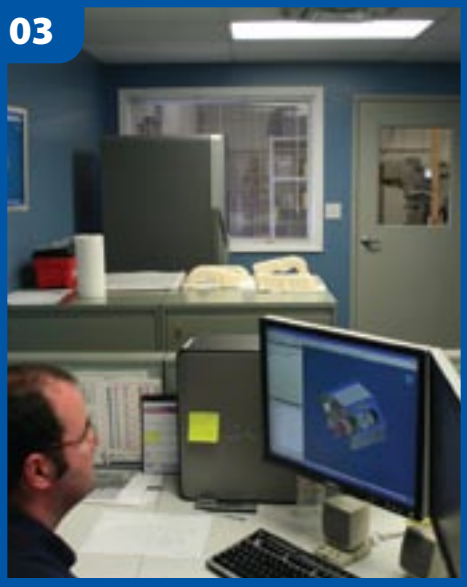
ERL SHOP TOUR

COMMERCIAL MARINE INC.

01

02

03



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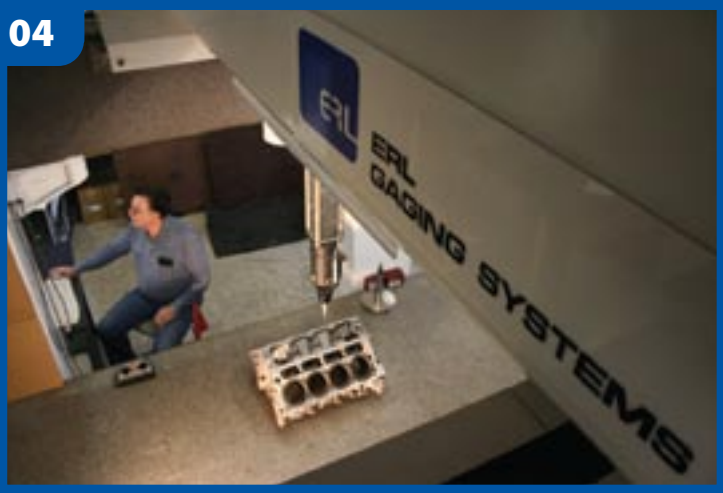

05

01 & 02 Cincinnati Laser CL800
ERL has 2 Cincinnati Laser Cutting Machines. They are the best in the world at cutting sheet metal efficiently, cleanly, and accurately. ERL produces parts ranging from thin Stainless steel rail parts to ¾" high strength steel marine parts with these exceptional lasers.

03 Engineering/Drafting
ERL uses world class CAD software. This software has design, Finite Element Analysis, CAD/CAM manufacturing, and motion simulation integrated into 1 complete package.

04 Engineering/Drafting Coordinate Measuring Machine
ERL maintains their exceptional quality control with a world class CMM. This machine measures parts within .0005" in a 1ft cube and .0010" over entire machine area. It features a solid granite foundation and weighs over 70,000lbs.

06

07

09

08

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05 ERL Patents
ERL leads the Commercial Marine industry with innovation. ERL currently has over 30 patents granted and multiple patents pending.

06 Robotic Welders
ERL has 2 state of the art robotic welders. These are used produce quality and efficient welding for production parts.

07 & 08 Haas CNC Machines
ERL currently has 12 Haas CNC milling and turning machines. These CNC machines are renowned for their ruggedness and reliability. They allow ERL to maintain exceptionally high quality standards.

09 Winch Assembly
ERL has state of art equipment to facilitate efficient, high quality assembly of winches

10 Flow Waterjet
ERL runs a Flow Waterjet Machine for cutting thick parts for the commercial marine and rail industries. In fact the Waterjet will cut up to 8" thick granite.

SECTION 01 CARGO GAUGING PRODUCTS

SECTION 02 OVERFILL PROTECTION PRODUCTS

SECTION 03 VENTING PRODUCTS

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SECTION 05

MARINE PRODUCTS

SECTION 06

FABRICATION PRODUCTS

SECTION 01

CARGO GAUGING PRODUCTS

FULL VIEW MODEL SGM-1™ Sight Glass - mounted on expansion dome.

FULL VIEW MODEL SGM-1™ Sight Glass - weather cover open.

Down view of open FULL VIEW MODEL SGM-1™ Sight Glass mounted next to an expansion dome.

FULL VIEW MODEL SGM-1™ Sight Glass - weather cover closed - mounted on expansion dome.

EXCERPTS FROM FEDERAL REGISTER

PART II - Dept. of Transportation - Coast Guard - June 21,1990
46CFR Part 39 Vapor Control Systems
Subpart 39.20 Design and Equipment
§ 39.20-3 Cargo gauging system -TB/ALL

The following section, reprinted here for your convenience, contains the USCG rules and regulations regarding cargo gauging systems.

39.20-3 Cargo gauging system-TB/ALL

(A) Each cargo tank of a tank vessel that is connected to a vapor collection system must be equipped with a cargo gauging device which:

(1) Provides a closed gauging arrangement as defined in Sec. 151.15.10 of this chapter that does not require opening the tank to the atmosphere during cargo transfer; "The Full Model View SGM-1 Marine Sight Glass satisfies this requirement. "

(2) Allows the operator to determine the liquid level in the tank for the full range of liquid levels in the tank; "The Radial Arm Gauge Tree satisfies this requirement."

(3) Indicates the liquid level in the tank at the location where cargo transfer is controlled; and

(4) If portable, is installed on the tank during the entire transfer operation.

(B) Except when a tank barge complies with Sec. 39.20-9(a) of this part each cargo tank of a barge must have a high level indicating device that: "The DS-39 Rising Stick Gauge satisfies this requirement."

(1) Provides a visual indication of the liquid level in the cargo tank when the cargo level is within 1.0 meter (3.28 feet) of the tank top;

(2) Has the maximum liquid level permitted under 39.30-1(e) of this part at even keel conditions conspicuously and permanently marked on the indicating device; and

(3) Is visible from all cargo control areas on the tank barge.

FULL VIEW MODEL SGM-1™

U.S. PATENT NO. 5,284,105

- **FULL COMPLIANCE WITH 46 CFR PART 39, Para. 39-20-3(a)**
  The FULL VIEW MODEL SGM-1 Marine Sight Glass is the tank barge industry standard for vessel operators complying with U.S. Coast Guard Regulations 46 CFR PART 39, Paragraph 39.20-3(a) and is suitable for use on ABS classed vessels.

- **FULL 59 SQ. IN. OF VIEWING AREA**
  Mounted adjacent to each cargo compartment control valve, the FULL VIEW MODEL SGM-1 provides the largest and clearest view into your cargo compartment available with a full 59 square inches of viewing area, without exposing personnel to hazardous vapors.

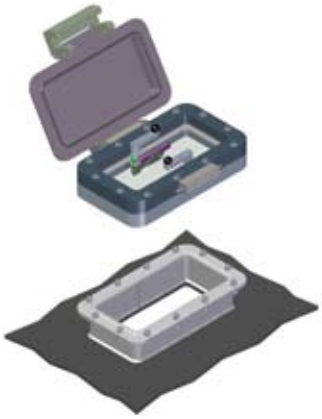
- **EASILY REPLACED WIPER BLADES**
  Dual wipers clean the cargo side of the BOROFLOAT™ glass. The wiper blades are easily replaced in the field, and are available in a variety of materials for maximum cargo compatibility. The FULL VIEW MODEL SGM-1 is available with Teflon™, EPDM and Viton wiper blade refills.

- **3/4" THICK GROUND AND POLISHED BOROFLOAT™ GLASS**
  Each glass is fully stress relieved with ground edges and radiused corners. Four built-in drain ports in the top glass flange prevent water pooling on the glass when the full weather cover is open.

- **SOLID CONSTRUCTION AND EASY MOUNTING**
  The upper and lower glass flanges are made of 1-1/2" thick stainless steel. The weather cover is made of cast aluminum and the standard deck mounting flange is made of stainless steel for easy weld-down to your deck.

FULL VIEW MODEL SGM-1™ MOUNTING OPTIONS

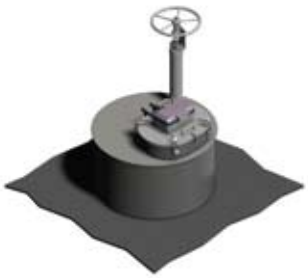
VERSATILE
ERL's exclusive separate deck mounting flange simplifies mounting and reduces the risk of glass damage during installation. The drawings below show various mounting arrangements. Teflon™ gaskets are furnished as standard and other gasket materials are available.



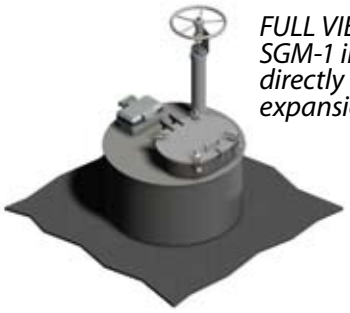
Once the weld-down deck flange (included) is welded to the deck using 1/8" diameter welding rod at 125 amps the FULL-VIEW MODEL SGM-1 is ready to bolt in place. A Teflon™ gasket and 12 stainless steel mounting bolts are included.

FULL-VIEW MODEL SGM-1 shown with Adapter Plate (mounting flange attached) designed for ready installation on a standard 24" riser.

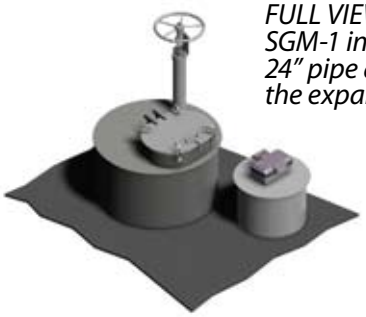
FULL-VIEW MODEL SGM-1 shown with weather cover closed.



FULL VIEW MODEL SGM-1 installed on the raised water-tight hatch located on an expansion trunk. A hatch backstop is recommended on this style of installation.

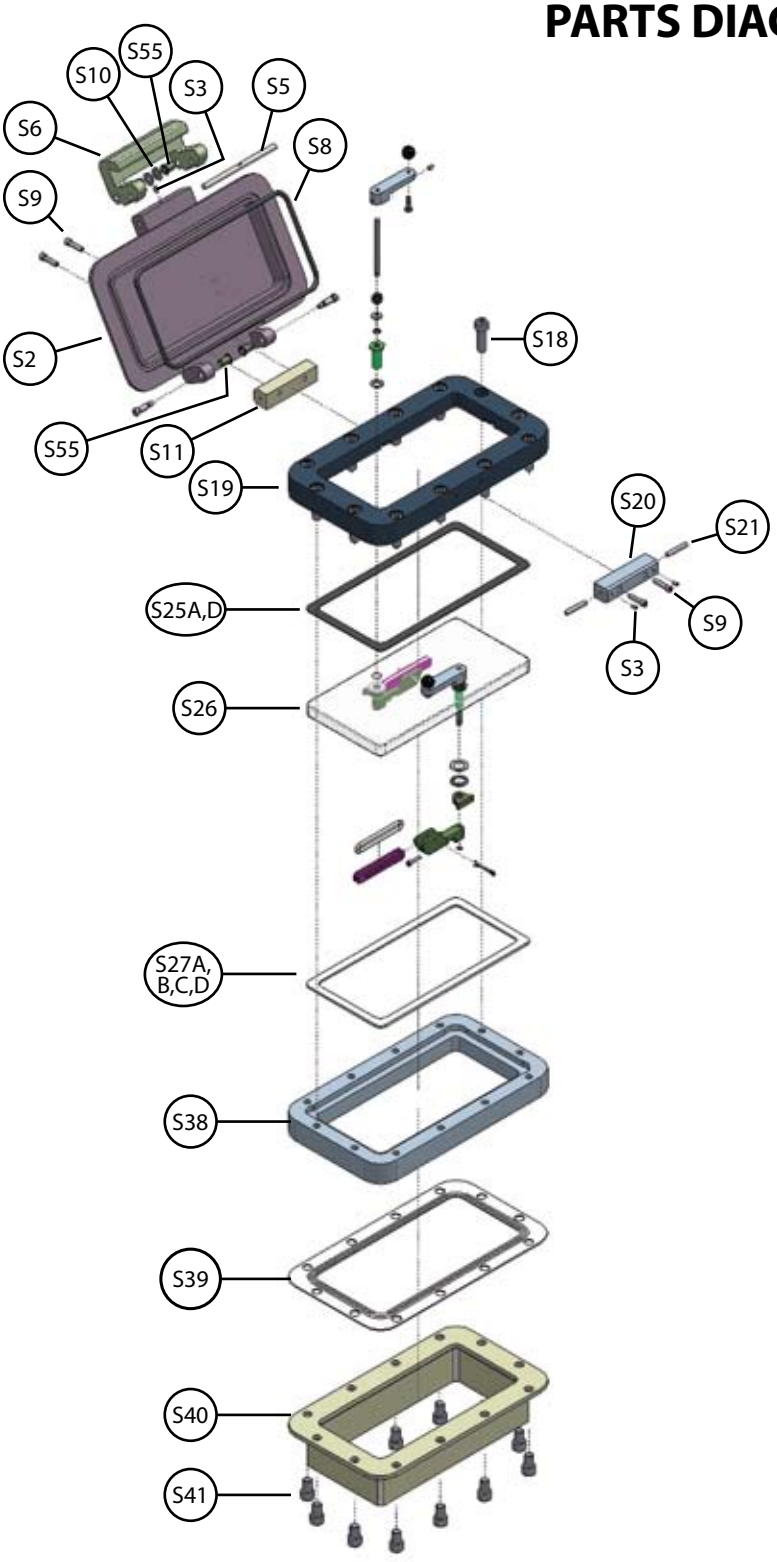


FULL VIEW MODEL SGM-1 installed directly on the expansion trunk.



FULL VIEW MODEL SGM-1 installed on a 24" pipe adjacent to the expansion trunk.

FULL VIEW MODEL SGM-1™ PARTS DIAGRAM



SGM-1 Wiper Assm. Parts List		
ITEM	DESCRIPTION	QTY
S2	Cover	1
S3	Set Screw 10-32 x 5/16	5
S5	Latch Shaft	1
S6	Latch	1
S8	O-Ring Gasket	1
S9	SHCS 1/4-20 x 1	4
S10	Washer	2
S11	Cover Hinge Block	1
S12	Shoulder Bolt, 1/4 x 3/8	2
S13	Knob	2
S14	Wiper Handle	2
S15	Wiper Shaft	2
S16	Spring	2
S17	Washer	2
S18	SHCS 1/2-20 x 1-1/2	12
S19	Top Flange	1
S20	Latch Pin Block	1
S21	Latch Pin	2
S22	O-Ring	2
S23	Bushing	2
S25A	Top Glass Seal - Neoprene	1
S25D	Top Glass Seal - Garlock	1
S26	Glass	1
S27A	Bottom Glass Seal - Non-asbestos	1
S27B	Bottom Glass Seal - Teflon	1
S27C	Bottom Glass Seal - Graph-oil	1
S27D	Bottom Glass Seal - Garlock	1
S28	Washer	4
S32	Wiper O-Ring	2
S33	Wiper Cartridge	2
S37	C-Clip	4
S38	Bottom Flange	1
S39	Unit Flange Gasket	1
S40	Mounting Flange	1
S41	SHCS 1/2-20 x 3/4	12
S48	SHCS 10-32 x 3/4	2
S49	Wiper Arm	2
S50	Cotter Pin	2
S51	Flat Washer	2
S52	Belleville Washer	2
S53	Stop Nut	2
S55	Latch Bushing	4

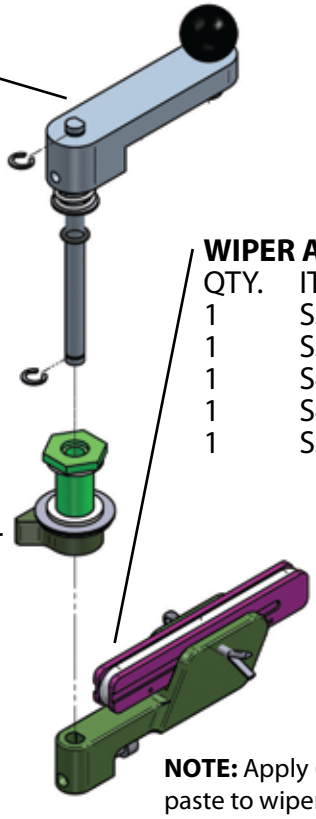
FULL VIEW MODEL SGM-1™
PARTS REFERENCE INFORMATION

WIPER HANDLE ASSEMBLY

QTY.	ITEM#	DESCRIPTION
1	S3	Set Screw
1	S12	Shoulder Bolt
1	S13	Knob
1	S14	Wiper Handle
1	S15	Shaft
1	S16	Spring
1	S17	Washer
1	S22	O-ring
2	S37	C-clip

WIPER BUSHING ASSEMBLY

QTY.	ITEM#	DESCRIPTION
1	S23	SS Bushing
2	S28	Teflon Washer
1	S51	Flat Washer
1	S52	Belleville Washer
1	S53	SS Stop Nut

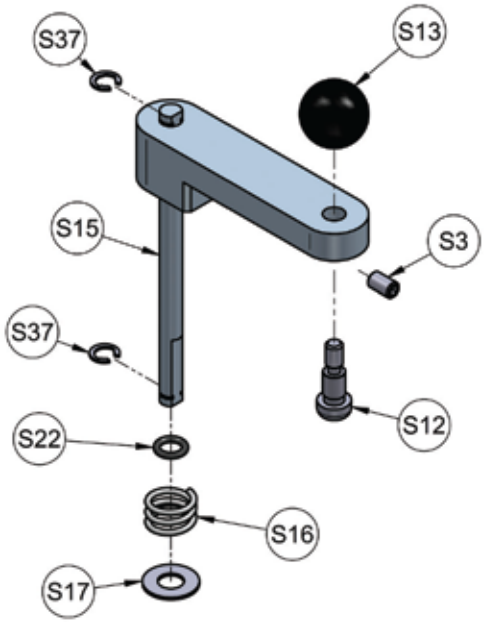


WIPER ARM ASSEMBLY

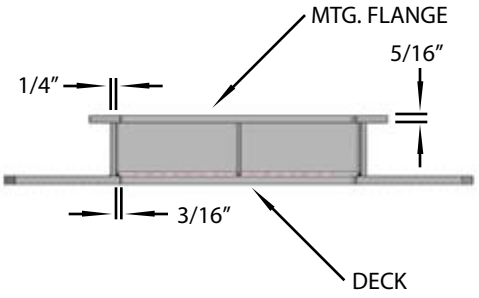
QTY.	ITEM#	DESCRIPTION
1	S32	O-Ring
1	S33	Wiper Cartridge
1	S48	SHCS 10-32 x 3/4
1	S49	Wiper Arm
1	S50	Cotter Pin

NOTE: Apply (Rector Seal T Plus 2) Teflon™ paste to wiper shaft #15 and Teflon™ bushing washers #28 during assembly.

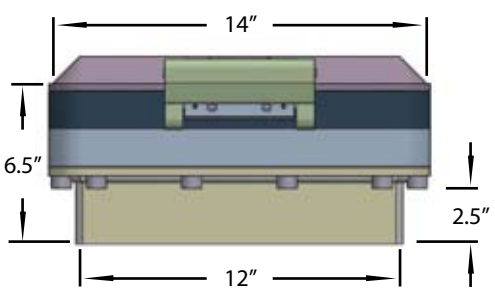
WIPER HANDLE ASSEMBLY

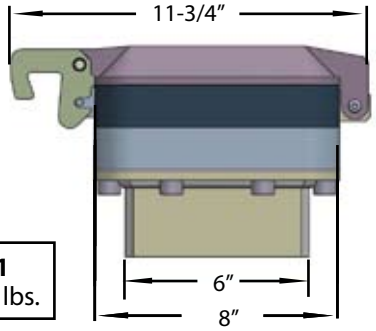


FULL VIEW MODEL SGM-1™ REFERENCE INFORMATION



Standard stainless steel weld-down mounting flange.





SGM-1
WT. = 65 lbs.

OPTIONS

UPPER GASKETS
Standard: Neoprene
Optional: Buna N ,Viton, EPDM, Garlock

LOWER GASKETS
Standard: Teflon™
Optional: Buna N, Goretex, Graflex, EPDM, Viton, Others on request.

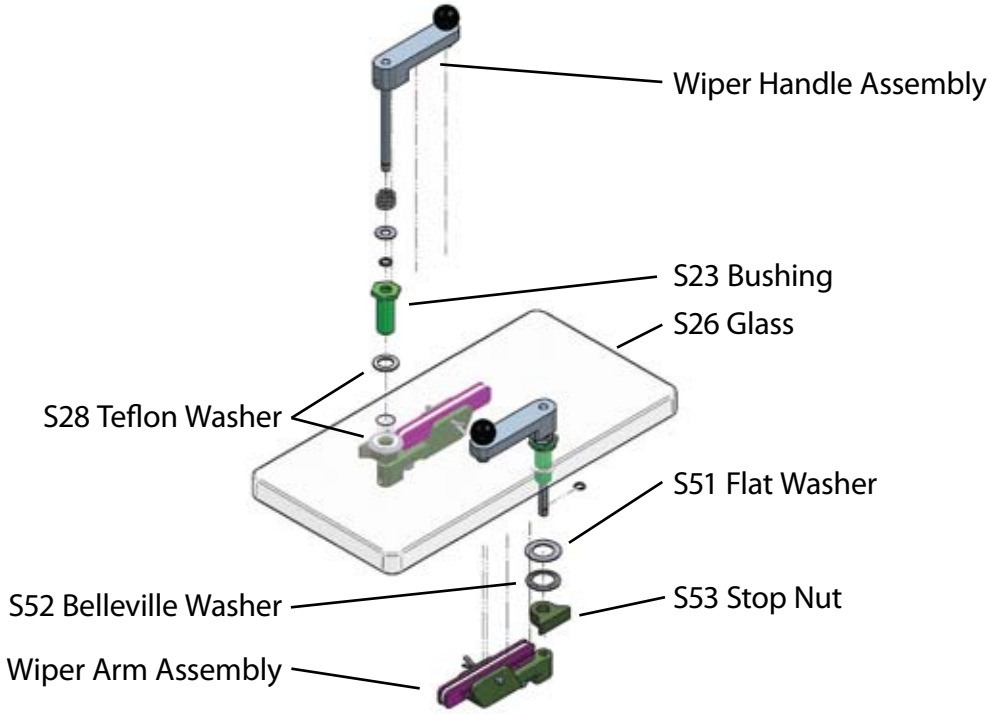
WIPERS
Standard: Teflon™
Optional: EPDM, Viton , Butyl, Buna N or any standard #328 O- ring.

Full-View Model SGM-1 installed on an expansion dome adjacent to the valve shut-off and access cover.

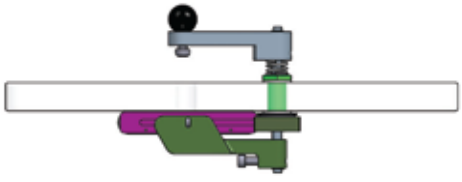
Glass can be ordered without holes.

Replacement glass and wiper arm assembly.

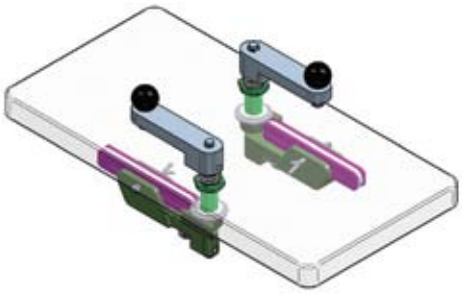
FULL VIEW MODEL SGM-1™ PARTS REFERENCE INFORMATION



WIPER ARM ASSEMBLY



Detail view of wiper installed.

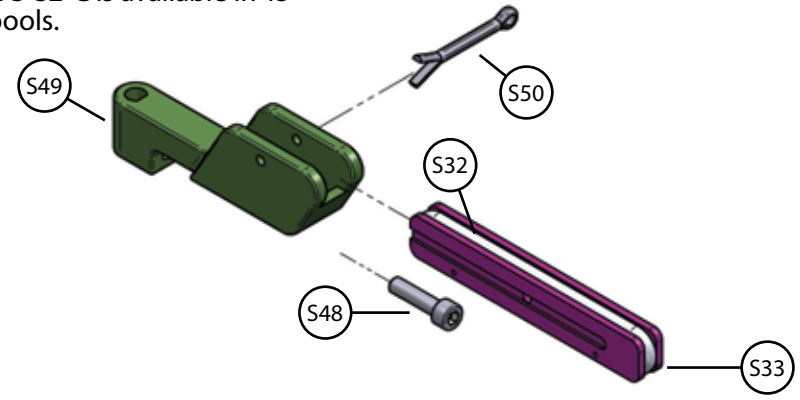


Standard: Teflon™

Optional: EPDM, Viton , Buna N or any standard #328 0-ring.

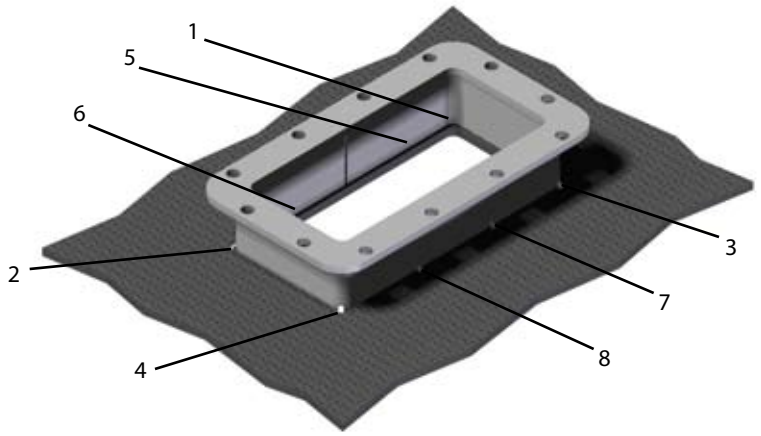
NOTE: The Wiper "blades" utilize standard thickness and diameter 0-rings universally referred to as size #328. Teflon™ replacement wiper blade material P/N S-32-C is available in 15 foot long spools.

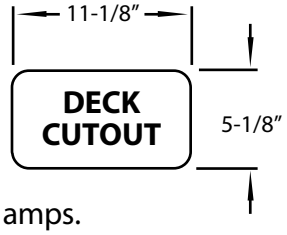
QTY.	ITEM#	DESCRIPTION
1	S32	O-Ring
1	S33	Wiper Cartridge
1	S48	SHCS 10-32 x 3/4
1	S49	Wiper Arm
1	S50	Cotter Pin



FULL VIEW MODEL SGM-1™ DECK FLANGE WELDING PROCEDURES

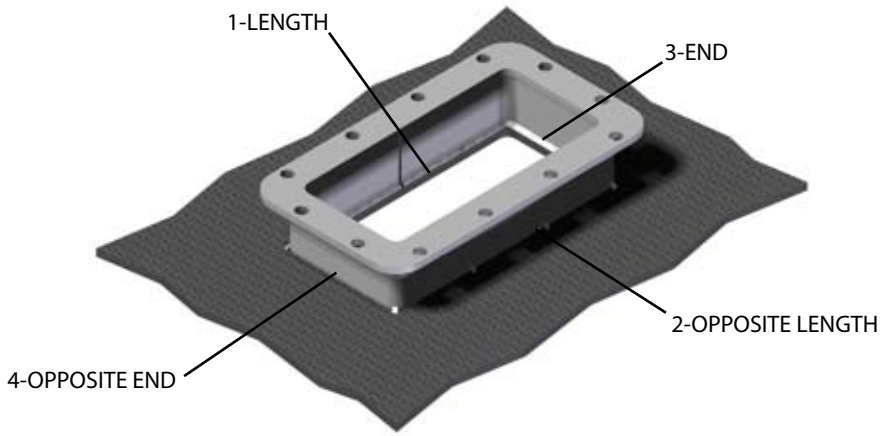
STEP 1
TACK WELDS



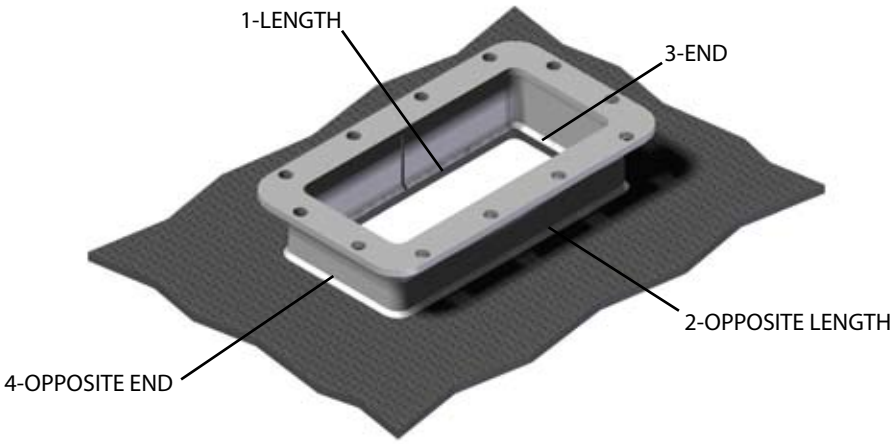


* Please use 1/8″ dia. welding rods with welder set to approximately 125 amps.
* For MIG use 0.045 wire at approx. 190 amps.

STEP 2
INSIDE WELDS



STEP 3
OUTSIDE WELDS



FULL VIEW MODEL SGM-1™ INSTALLATION INSTRUCTIONS

1. Deck mounting flange is attached to the bottom of the Sight Glass by four bolts. Remove these bolts and save them. You will have (12) 1/2" - 20 x 3/4" stainless steel mounting bolts. Store the Sight Glass upside down until you are ready to reassemble it to the deck flange.

Failure to do so may result in damaged glass because the wiper flange extends below the bottom glass flange.

NOTE: Use 1/8" diameter welding rod for the installation. Set welder to approximately 125 amps.
For MIG use 0.045 wire at 190-195 amps.

2. Tack weld the deck mounting flange in place as shown in steps 1 and 2 on page 10.
Do not clamp it to the deck in any way prior to tack welding. Please take all possible precautions to preserve this flatness and surface condition during the weld. Finish by welding the inside perimeter and the outside perimeter of the flange as shown in step 3 on page 10. Failure to follow this welding procedure can result in a warped flange that may not seal.

3. With the mounting bolts provided, sandwich the Teflon™ mounting flange gasket between the bottom of the Sight Glass and the top surface of the deck mounting flange. Rectorseal T Plus 2, or Teflon™ enriched sealant, should be applied to the Teflon™ mounting flange gasket to insure that there are no leaks. Install all (12) mounting bolts finger tight and proceed to tighten them in an opposite rotational pattern to a torque of 12 foot pounds.

4. The Full View Model SGM-1 Sight Glass should be mounted adjacent to the cargo control valve handwheel, with an unobstructed view of the sump and the ladder or gauge tree. NEVER mount the Sight Glass over an internal frame which blocks the view through the Sight Glass.

If you have any questions regarding installation contact ERL at 812-948-8484.

WARNING

DO NOT WELD UNLESS THE BARGE IS DEVOID OF CARGO AND THE CARGO TANK HAS BEEN CLEANED AND GAS FREED. EXPLOSION HAZARD MAY EXIST.

BEFORE WELDING: SUITABLE EYE PROTECTION MUST BE WORN TO PROTECT AGAINST EYE DAMAGE DUE TO WELD FLASH. SUITABLE NON-FLAMMABLE GLOVES AND CLOTHING ARE REQUIRED.

ERL MODEL SGMRD-8™

- **FULL REGULATORY COMPLIANCE WITH 46 CFR PART 39 PARAGRAPH 39-20-3(a)**
  The ERL Model SGMRD-8, 8" round marine sight glass complies with U.S. Coast Guard regulations and is suitable for use on all liquid cargo vessels.

- **ROUND 56 SQUARE INCH VIEWING AREA**
  Mounted adjacent to each cargo valve control handwheel, the ERL Model SGMRD-8 gives the tankerman a 56 square inch round viewing port into the compartment without exposure to potentially hazardous vapors.

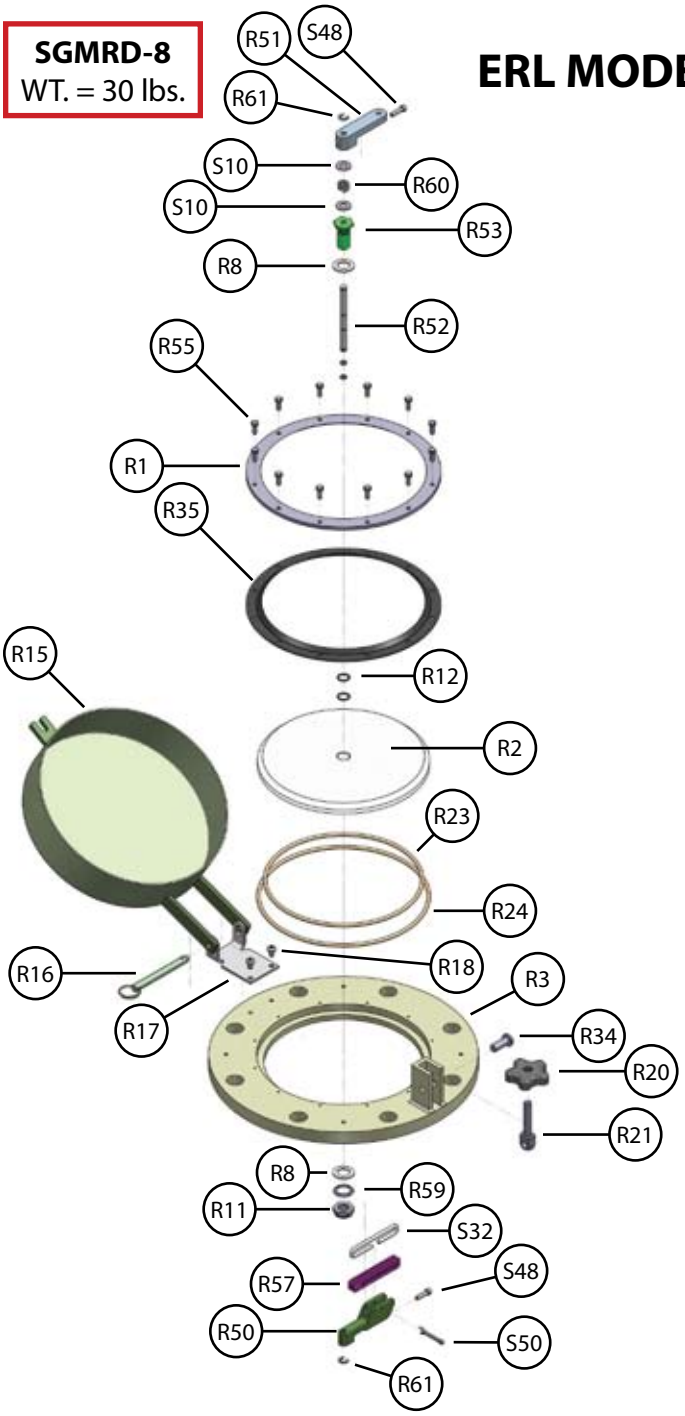
- **RADIAL GLASS WIPER**
  Radial wiper cleans the bottom of the BOROFLOAT™ glass for an unobstructed view into the cargo compartment. The easily replaced wiper blades are available in Viton, Teflon, EPDM or Butyl.

- **1/2 INCH THICK GROUND AND POLISHED BOROFLOAT™ GLASS**
  Each 8.5" diameter BOROFLOAT™ glass is fully stress relieved with ground edges. The top face of the glass is above the stainless steel frame to prevent water pooling when used during rain.

- **SOLID CONSTRUCTION AND EASY MOUNTING**
  The ERL Model SGMRD-8 is constructed from 300 series stainless steel and mounts to any standard 8" 150 lb. class mounting flange, having (8) 0.88" diameter holes on a 11.75" diameter bolt circle.

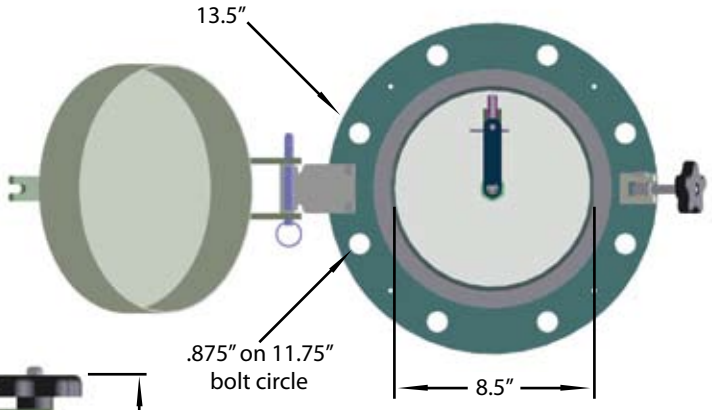
SGMRD-8
WT. = 30 lbs.

ERL MODEL SGMRD-8™



8" Round Sight Glass - Parts List		
ITEM	PART NAME	QTY
R1	Retainer Ring	1
R2	Glass	1
R3	Flange Weldment	1
R8	Washer	2
R11	Nylock Nut 5/8-18	1
R12	O-Ring	2
R15	Cover Weldment	1
R16	Hinge Pin	1
R17	Hinge Bracket	1
R18	BHCS 1/4-20 x 3/8	2
R20	Latch Knob	1
R21	Pivot Rod	1
R23	Glass O-Ring, inner	1
R24	Glass O-Ring, outer	1
R26	Flange	1
R34	BHCS 3/8-16 x 1	1
R35	Retainer Gasket	1
R50	Wiper Arm	1
R51	Wiper Handle	1
R52	Stem	1
R53	Bushing	1
R54	Stem O-Ring	2
R55	Hex Head Bolt 10-32 x 1/2	12
R57	Wiper Cartridge	1
R59	Belleville Washer	1
R60	Spring	1
R61	C-Clip	2
S10	Washer 5/16	2
S32	Teflon Wiper	1
S48	SHCS 10-32 x 3/4	2

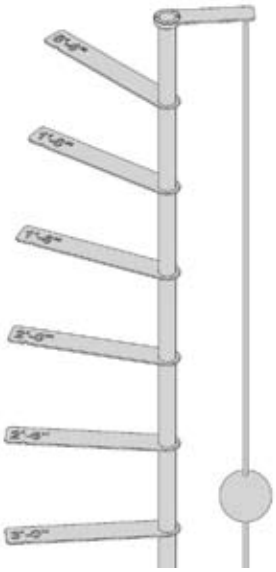
DOWN VIEW



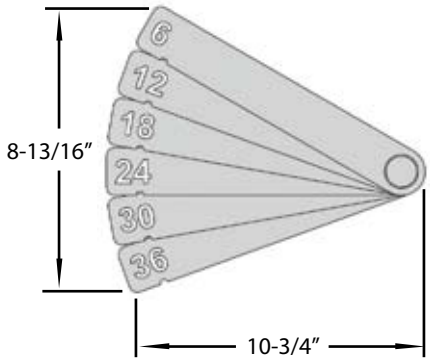
SIDE VIEW

Option: Glass can be ordered without holes.

RADIAL ARM GAUGE TREE™



UPPERLEVEL RADIAL ARM GAUGE TREE WITH FLOAT MARKER



DOWN VIEW, UPPER LEVEL RADIAL ARM GAUGE TREE (Outage shown)

UPPERLEVEL RADIAL ARM GAUGE TREE

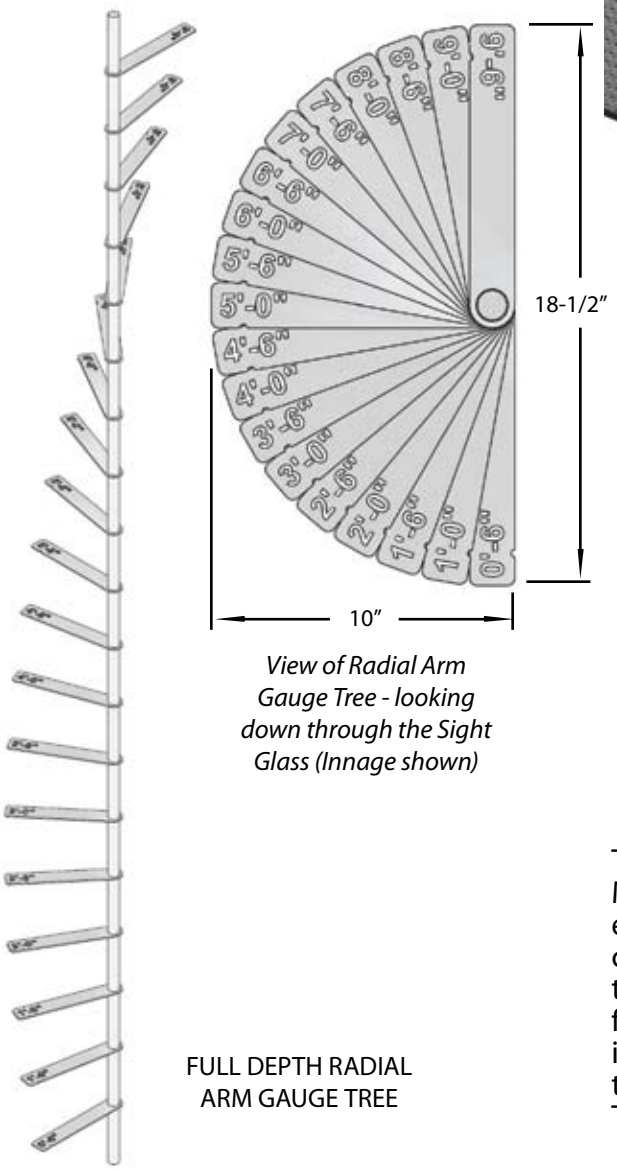
- **FULL REGULATORY COMPLIANCE**
  ERL's Radial Arm Gauge Tree is USCG accepted. When used in conjunction with the Full-View SGM-1 Marine Sight Glass, the full-length Radial Arm Gauge Tree fully satisfies 46 CFR 39.20-3.2.

- **IMPROVED DEPTH PERCEPTION**
  The Radial Arm Gauge Tree improves the tankerman's depth perception relative to the liquid level, helping prevent overfill spill during topping off of cargo tanks. An optional float marker is available and is recommended for white water products.

- **EASY INSTALLATION AND HEAVY-DUTY CONSTRUCTION**
  Constructed from 300 series stainless steel for extended service life, the Radial Arm Gauge Tree is as easily installed during barge construction or as a retro-fit installation to an existing vessel. The shipyard can easily bracket the Gauge Tree off of the bulkhead, the ladder, or from the underside of the deck.

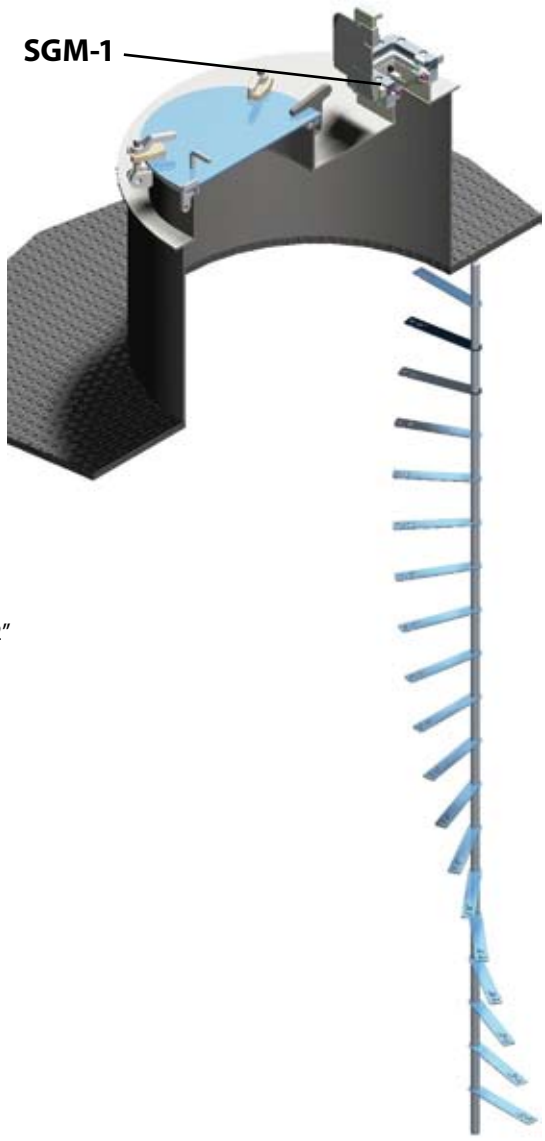
RADIAL ARM GAUGE TREE™

The Radial Arm Gauge Tree is a very practical piece of equipment that aids the tankerman's depth perception when visually gauging cargo levels. Gauge Tree tabs are spaced 6" apart and can reflect either cargo innage or outage. The 36" upper level "top off" gauges, or any length you specify are available. An optional 2" Dia. marker float can be added for use in clear cargo.



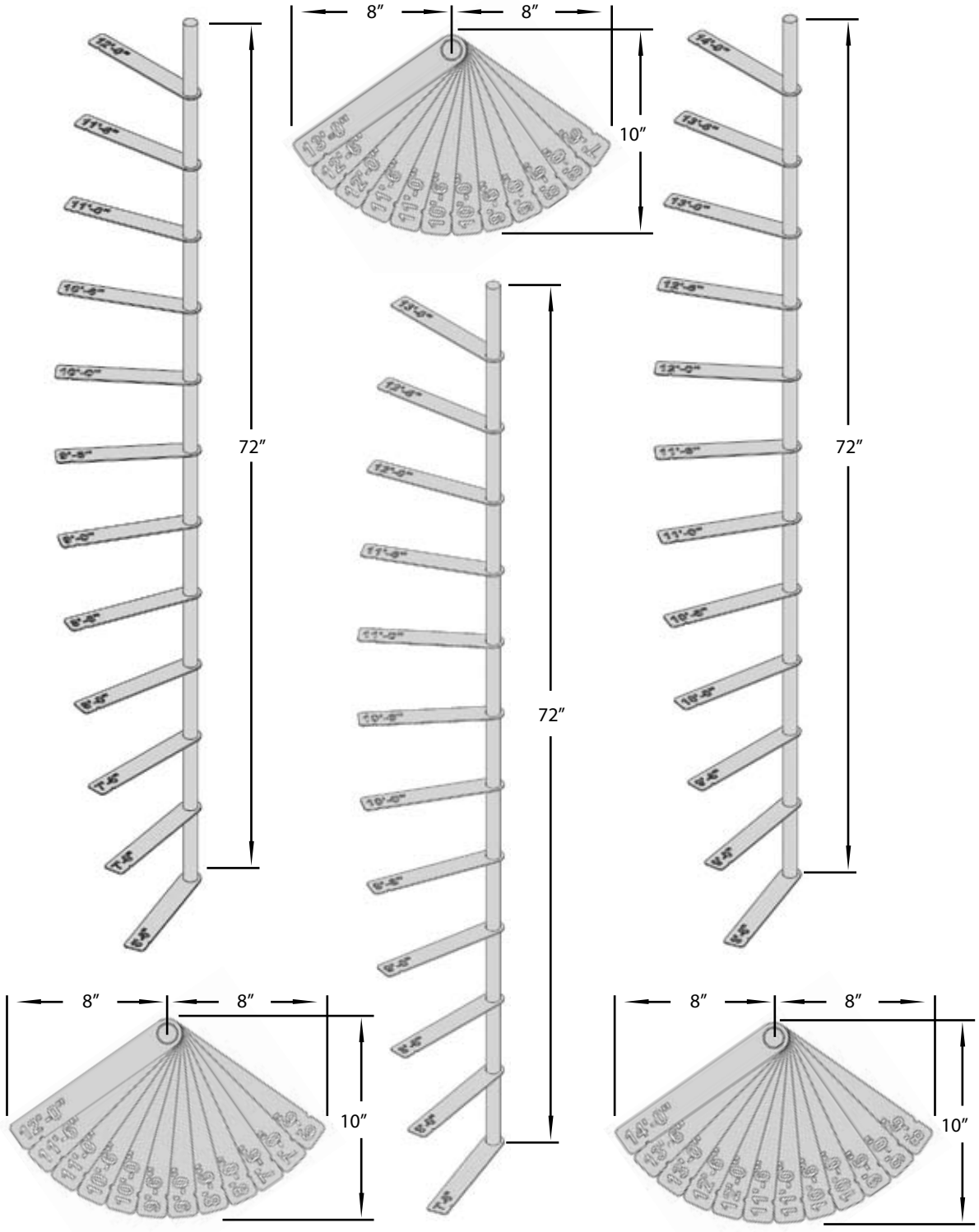
View of Radial Arm Gauge Tree - looking down through the Sight Glass (Innage shown)

FULL DEPTH RADIAL ARM GAUGE TREE



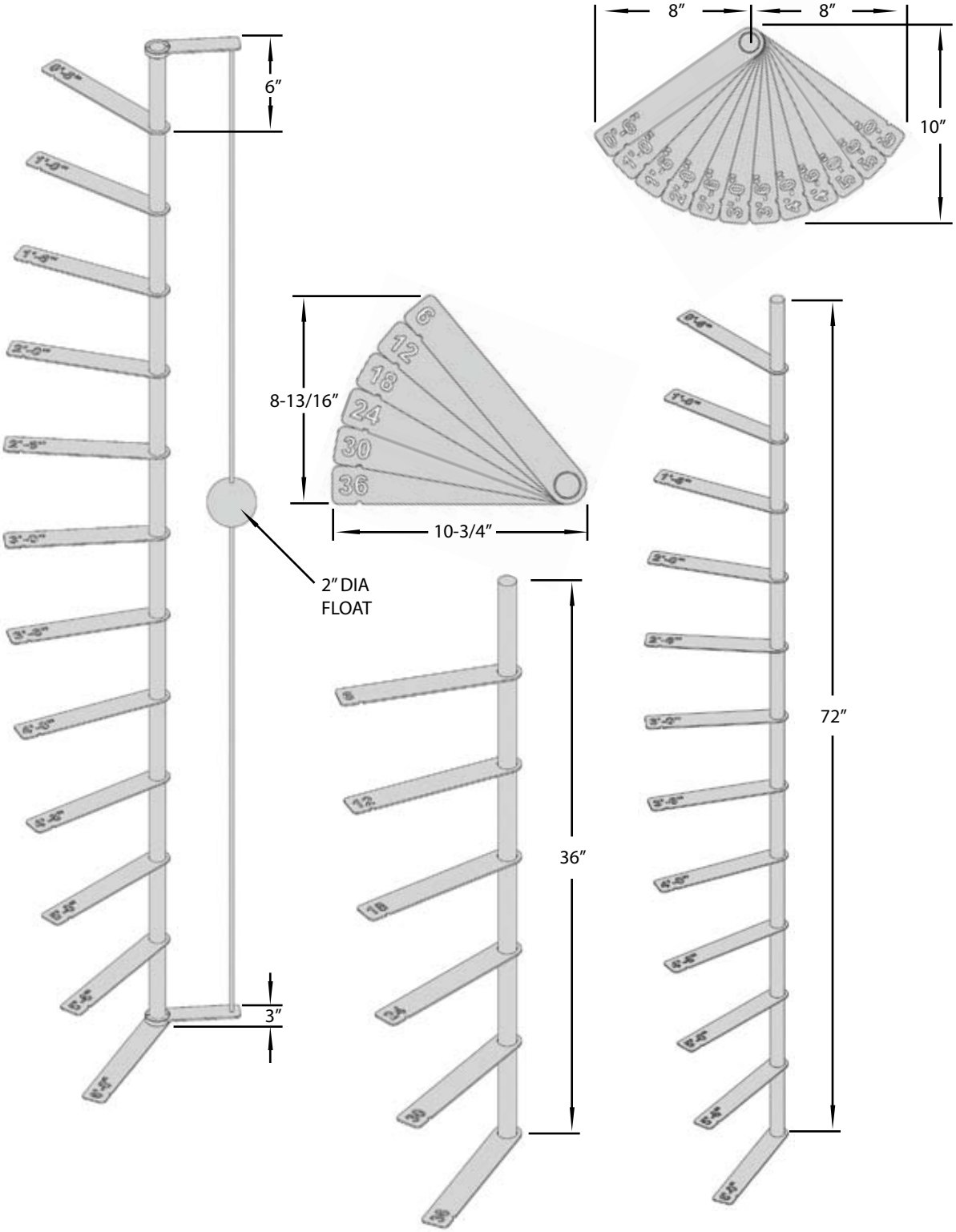
The Full View Model SGM-1 Marine Sight Glass provides an excellent field of view into the cargo compartment, allowing the tankerman to observe the suction/ fill sump during final stripping and initial fill as well as the liquid level up the length of the Radial Arm Gauge Tree.

RADIAL ARM GAUGE TREE™
INNAGE SHOWN



* When ordering specify overall length and the numbers that you want on the top and the bottom tabs.

RADIAL ARM GAUGE TREE™ OUTAGE SHOWN



* When ordering specify overall length and the numbers that you want on the top and the bottom tabs.

VHSG™ VENT HEADER SIGHT GLASS

- **SUPER HEAVY DUTY CONSTRUCTION**
  Our extra rugged Vent Header Sight Glass is built to provide many years of low-maintenance service. Easily mounted to any standard 150-lb. class flange, ERL also offers optional stainless steel mounting hardware and standard (or custom materials) gaskets.

- **100% STAINLESS STEEL**
  Made of 300 Series Stainless Steel, ERL utilizes premium grade Teflon™ for the glass seals and 1/2" thick BOROFLOAT™ brand glass for the lense. Optional glass seal materials available upon request.

- **ALLOWS SAFE VISUAL INSPECTION**
  ERL's Vent Header Sight Glass allows safe visual inspection of the inside of the vent headers without exposing personnel to hazardous vapors. If you transport polymerizing cargos, ERL's Vent Header Sight Glasses will pay for themselves in one U.S. Coast Guard inspection.

AVAILABLE SIZES

FLANGE SIZE	6"	8"
Order No.	# VHSG-1-6	*VHSG-1-8

**Optional Lens Wiper Available.*

Full View Model SGM-1™ Sight Glass - weather covers closed - mounted on expansion domes.

MODEL DS-39 RISING STICK GAUGE™ FOR TANK TOP LIQUID LEVEL INDICATION

- **FULL REGULATORY COMPLIANCE**
  The Model DS-39 is U.S. Coast Guard accepted. It satisfies 46 CFR 39.20 3(b) as well as OPA 90 regulations for overfill devices and is suitable for use on ABS classed vessels.

- **SAFETY**
  Personnel are not exposed to hazardous cargo vapors on the tank top when using the reliable Model DS-39 Liquid Level Gauge. The hazard of overfill spills is greatly reduced when properly using the DS-39.

- **EASY INSTALLATION**
  Simply bolt the DS-39 to an 8" flanged pipe stand located at or near the geometric center of the cargo compartment. The deck opening must be large enough for the 7" dia. float to pass through. ERL can provide optional prefabricated mounting standpipes, flange gaskets and mounting hardware upon request.

- **HEAVY DUTY CONSTRUCTION**
  All welded components are 300 series stainless steel. Powerful NEODYMIUM #38 rod magnets are used to insure superior coupling strength between the CERAMIN #8 float magnet and the tri-colored gauge rod. The tri-colored gauge rod, color coded to industry standards, is hermetically sealed by design, to provide extended service life.

Excerpted from Federal Register, 21 Oct "94" 33CFR Part 155
Minimum Standards For Overfill Devices; Barges

The Coast Guard will allow the owners and operators of tank barges to select one of three alternatives: (1) an overfill alarm on each tank which includes circuitry to sufficiently identify which individual tanks' overfill system is alarming, (2) an automatic shutdown system for the entire barge and transfer facility, or (3) a high level indicating device installed on each tank, such as a stick gauge.

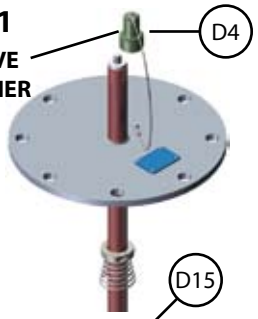
DESCRIPTION

ERL's magnetically coupled rising stick gauge is designed to provide continuous visual liquid level indication on the cargo tank top. The length of indication is specified when ordering and can include full compartment depth configurations. One meter of indication reflecting the liquid level in the upper one meter of the cargo compartment is typical and fulfills the minimum requirements set forth in 46 CFR 39.20-3(b) as well as OPA 90 requirements for overfill devices. The tricolored gauge rod with a powerful magnet at its base is positioned inside a stainless steel pipe extending down from the tank top. A 7" diameter float with powerful magnets inside floats up and down the sealed pipe with changes in the liquid level. Due to the powerful magnetic coupling between the float and the internal gauge rod, they move together providing a continuous visual indication of liquid level on the tank top.

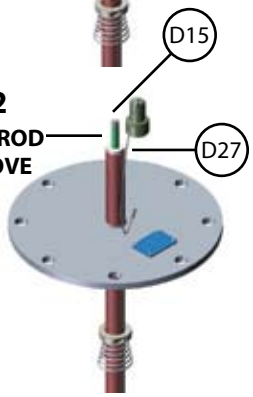
When not in use, and with the tri-colored gauge rod lowered within the stainless steel tube, a protective weather cap, with tether, is screwed in place. The operation is fully automatic, but the user must remove the weather cap prior to each use and replace the cap after each use.

MODEL DS-39 RISING STICK GAUGE™ OPERATING INSTRUCTIONS

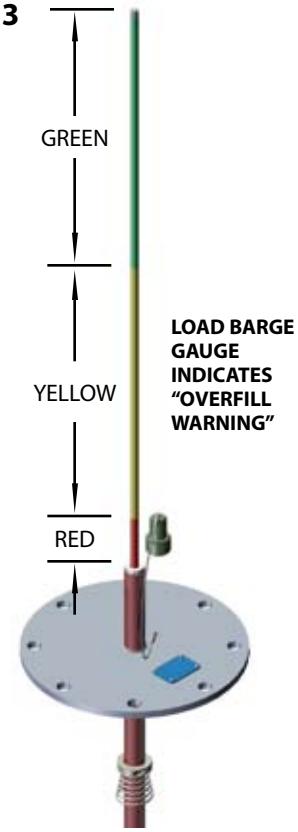
Step 1
REMOVE WEATHER CAP



Step 2
VERIFY ROD CAN MOVE



Step 3

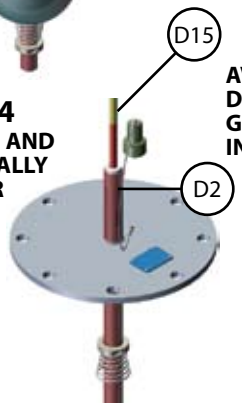


Periodically water should be removed from the main tube. In subfreezing temperature, antifreeze should be added to the main tube to prevent freeze up.

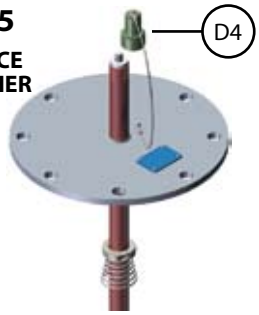
Avoid dropping the gauge into the tube after use.

ERL Model DS-39 Rising Stick Gauge

Step 4
GRASP AND MANUALLY LOWER



Step 5
REPLACE WEATHER CAP



MODEL DS-39 RISING STICK GAUGE™ ORDER CHECKLIST

REFER TO FIGURES 1 & 2 TO ANSWER THE FOLLOWING QUESTIONS

1) Tank Depth: _____ feet _____ inches
2) Flanged standpipe height _____ inches
3) Deck Thickness _____ inches
4) Distance from underside of deck to highest level indicated _____ inches.
5) Verify "A" dimension: 2 _____ +3 _____ +4 _____ ="A" Dimension _____ (7" min.)
6) Specify overall length of unit: Inches of indication _____ + "A" Dim. _____ + 8" + 6" O.A.L. _____

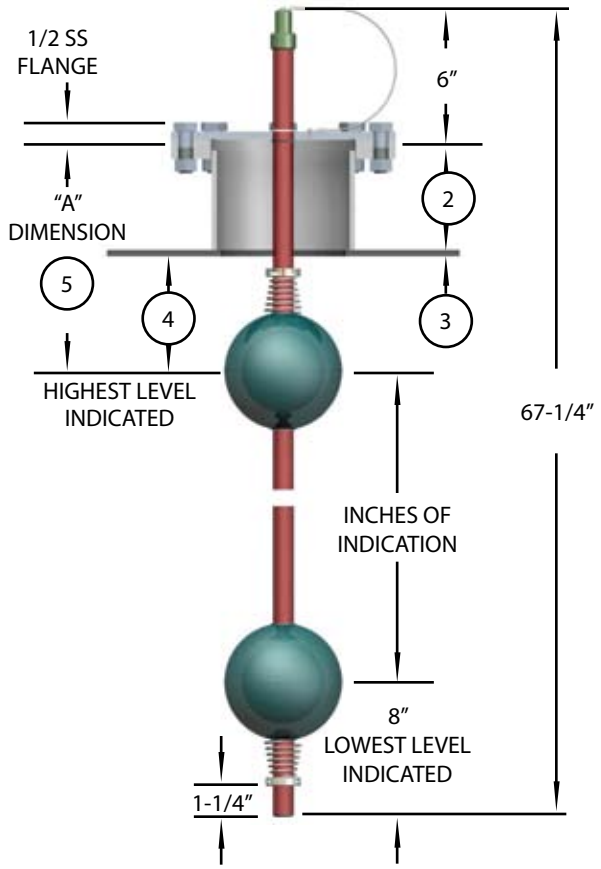


FIGURE 1
NOTES:
1) The flanged standpipe, gasket and s.s. mounting hardware are available as options.
2) Installation at or near the geometric center of the cargo compartment is by customer.
3) "A" Dimension is 14 inches if not specified otherwise.

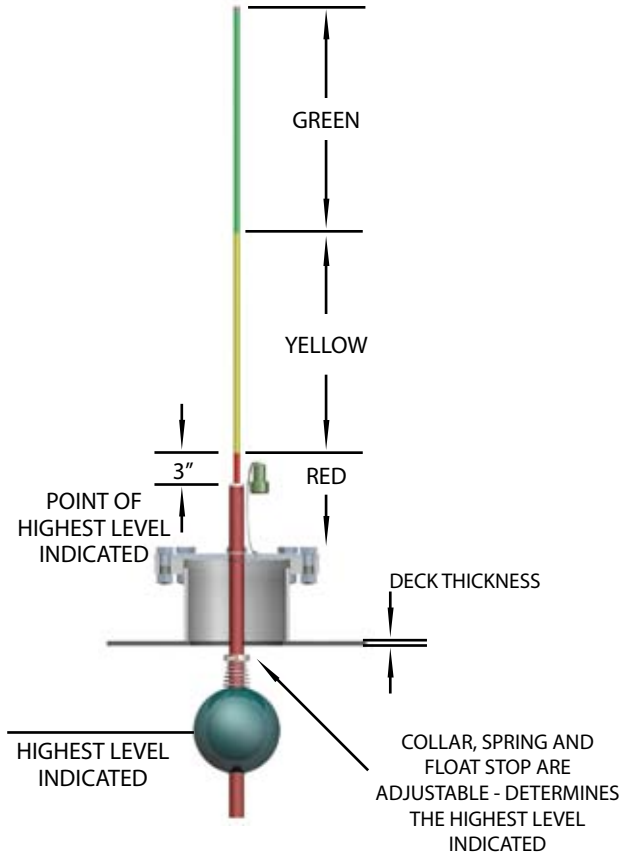
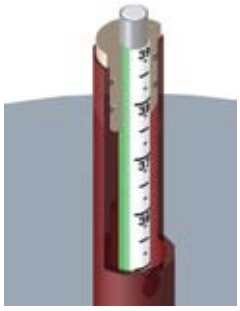


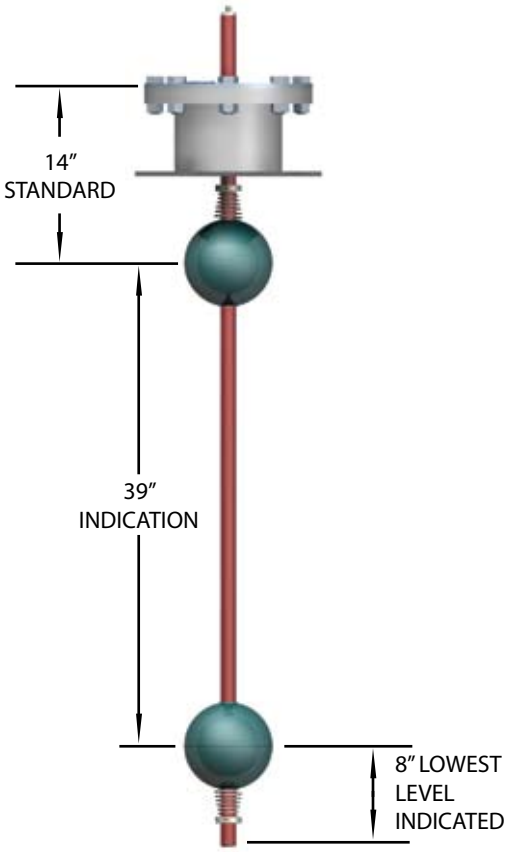
FIGURE 2
NOTES:
1) Dipstick shown at the highest level of indication.

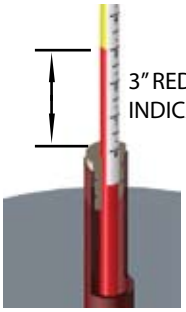
MODEL DS-39 RISING STICK GAUGE™ STANDARD DIMENSIONS

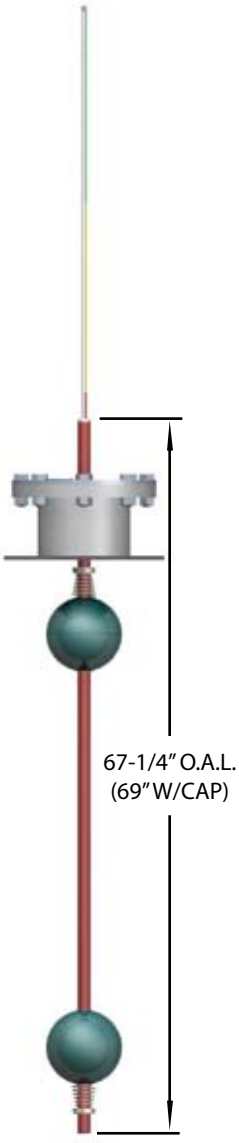
ERL can make your DS-39 Rising Stick Gauge to your specifications. One meter of indication meets the minimum overfill requirements.

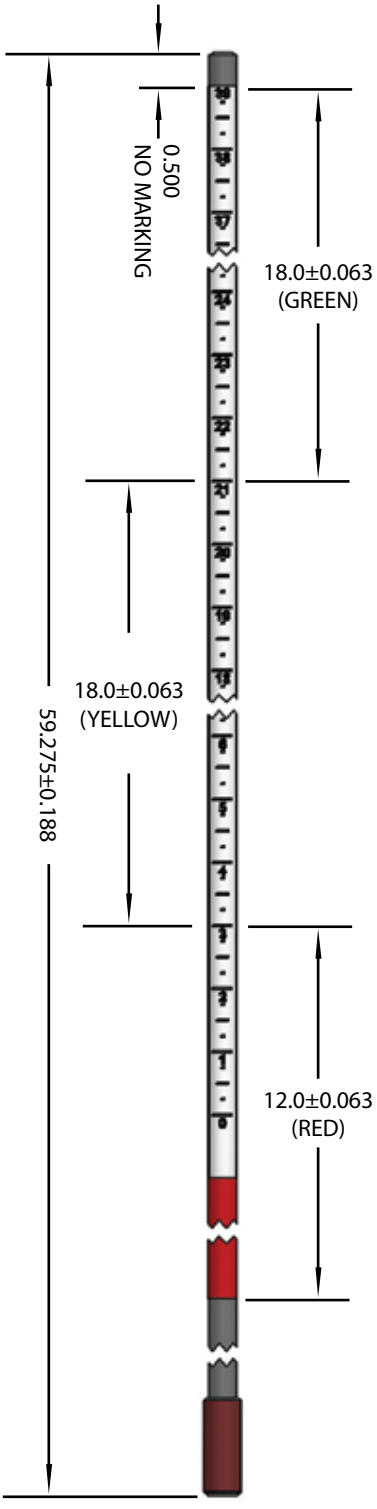
The 7.0" diameter float is 50% submerged in liquid having a specific gravity of 1.0 S.G.











MODEL DS-39 RISING STICK GAUGE™

REPLACEMENT TRI-COLORED GAUGE STICKS

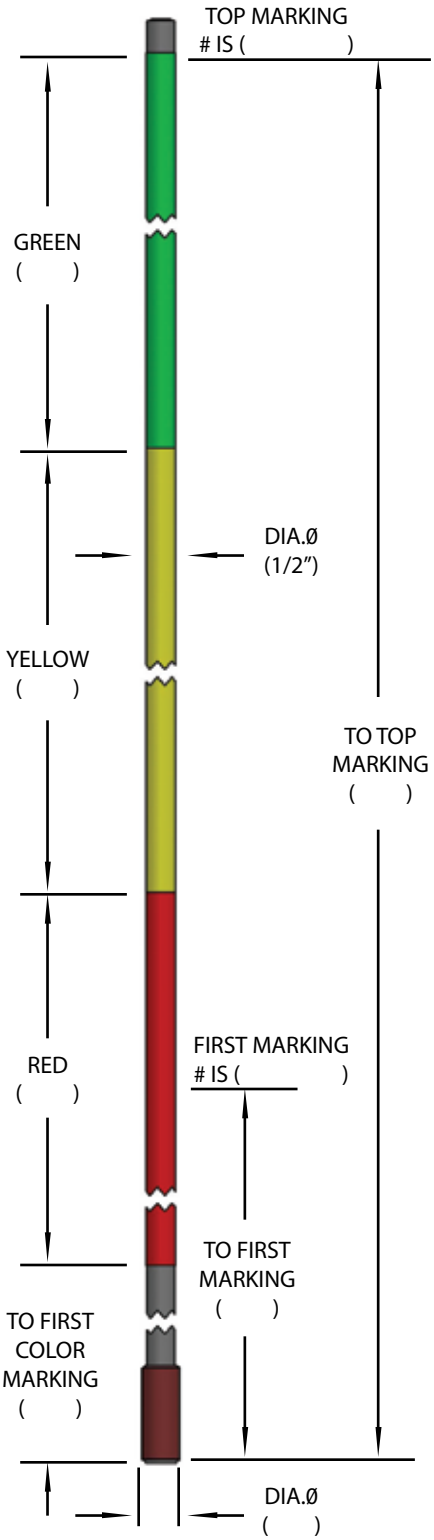
ERL's Tri-colored gauge sticks are designed and manufactured to provide extended service life. If the Gauge Stick becomes damaged, replacements are readily available. Simply provide the Serial No. of the old stick, which is located near the magnet housing at the base of the stick, or provide the Serial No. of the unit from the data tag on the unit flange.

Confirmation of the dimensions listed below and identified by the adjacent drawing are required if the replacement stick is being ordered for use in a non-ERL manufactured unit.

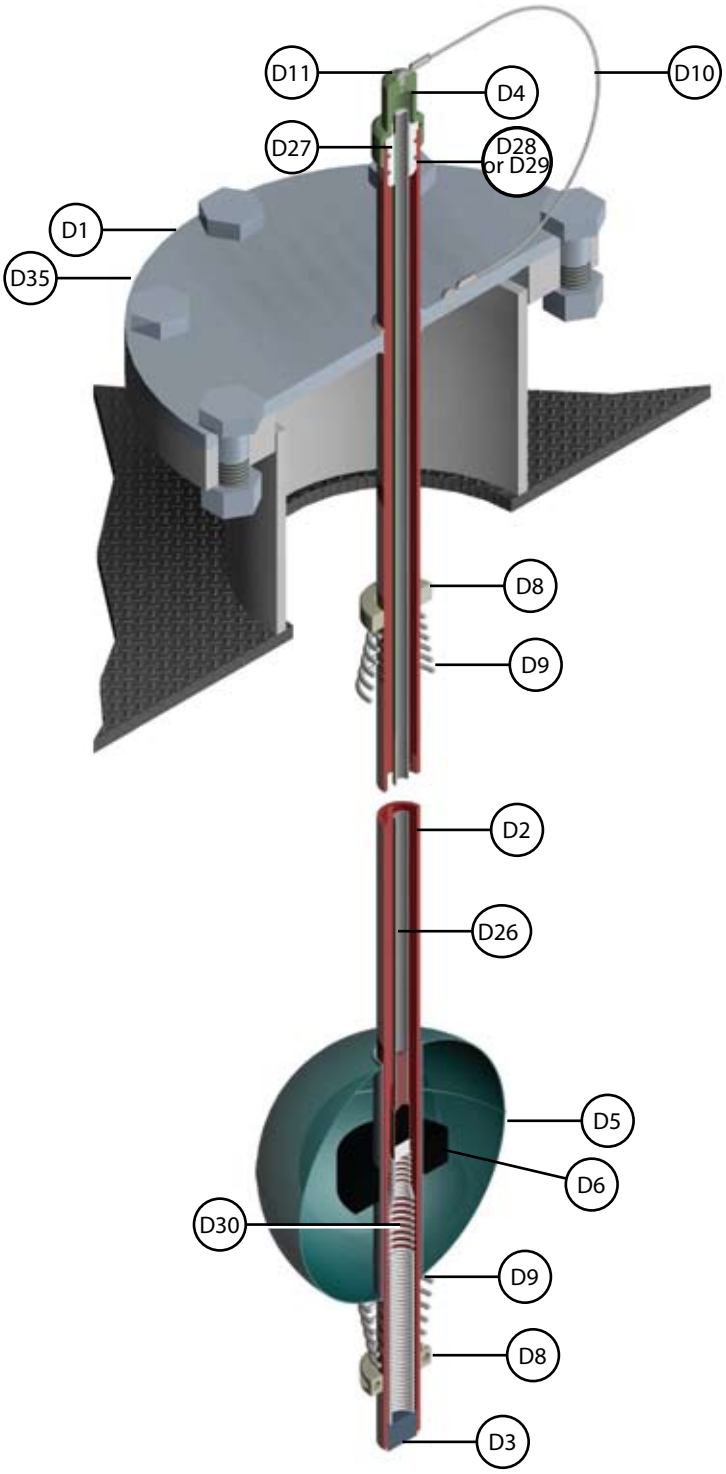
A. _____ Overall length
B. _____ Green Length
C. _____Yellow Length
D. _____ Red Length
E. _____Top Gauge Marking Number
F. _____ Diameter of magnet housing
G. _____ Diameter of gauge rod
H. _____ Guide Bushing diameter
_____ (if non-ERL unit)

ERL's DS-39 uses a standard Teflon guide bushing. When ordering and using ERL Tri-colored gauge sticks for use in non-ERL manufactured gauges be sure to include all the information requested. This information will be important if it is necessary for us to provide a new Teflon guide bushing sized to fit your unit.

Standard ERL Tri-colored gauge sticks perform well to 280°F. Prolonged use in temperatures higher than 280°F can cause the green, yellow and red colors to fade. For high temperature service specify our H.T. Series, high temperature gauge rods good for continuous service to 365°F.



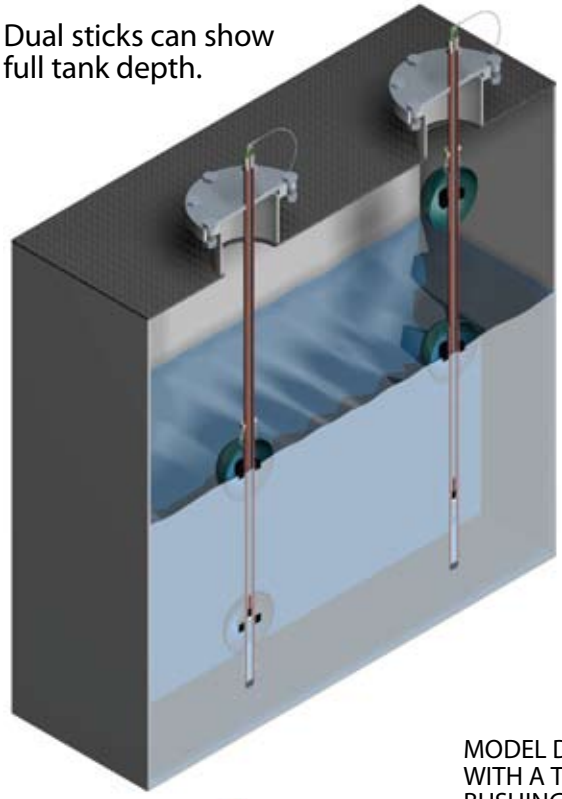
MODEL DS-39 RISING STICK GAUGE™



Parts List ~ DS-39 Rising Stick Gauge		
ITEM	PART NAME	QTY
D1	Flange	1
D2	External Main Tube	1
D3	Main Tube Plug	1
D4	Main Tube Top Cap	1
D5	Float	1
D6	Float Magnet	2
D8	Shaft Collar	2
D9	Float Spring	2
D10	3D10 Lanyard	1
D11	Drive Screw	2
D12	I.D. Tag	1
D13	Drive Screw	4
D15	Internal Stick	1
D16	Internal Magnet Holder	1
D17	Internal Magnet	1
D18	Reflective Sheeting, Green	1
D19	Reflective Sheeting, Yellow	1
D26	Internal Stick Assembly	1
D27	Top Tube Bushing	1
D28	O-Ring, Viton	2
D29	O-Ring, EPDM	2
D30	Bumper Spring	1
D33	Flat Washer	1
D35	Weldment 2	1
D38	Weldment 1	2
D4HT	Main Tube Top Cap (High Temp)	1
D16HT	Internal Magent Holder (High Temp)	1
D17HT	Internal Magnet (High Temp)	1

MODEL DS-39 SPECIAL RISING STICK GAUGE™

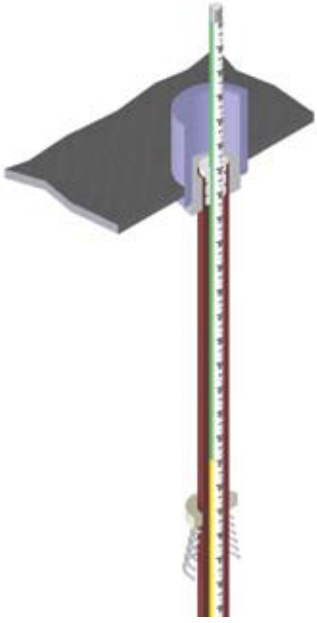
Dual sticks can show full tank depth.

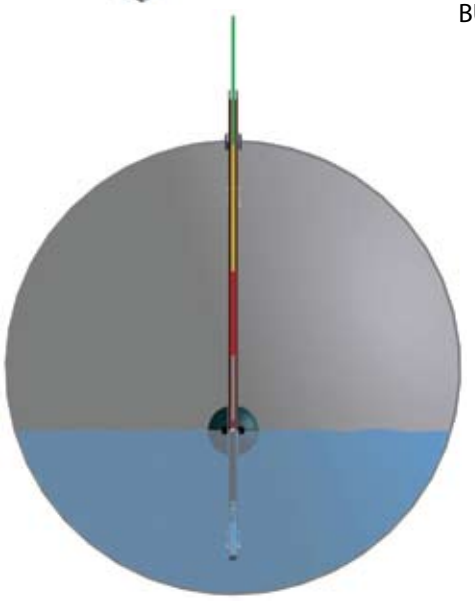


Threaded mounting bushings, special flanges and hatch cover mounting arrangements are available.

MODEL DS-39 WITH A THREADED BUSHING

MODEL DS-39 THREADED BUSHING WITH STICK SHOWING





MODEL DS-39 CAN BE USED ON SLOP TANKS OR FUEL TANKS

MODEL DS-39 USED ON TOWBOAT FUEL TANK

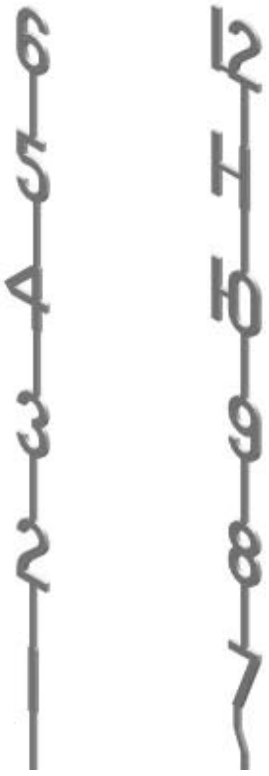
HIGH LEVEL/OVERFILL TABS

- **100% STAINLESS STEEL**
  ERL offers High Level/Overfill Tabs that are manufactured out of 300 series stainless steel which ensures a quality product with extend life during field operations.

- **OPERATIONS & MANUFACTURING**
  ERL's High Level/Overfill Tabs are easily attached to the Radial Arm Gauge Tree by a stainless steel split collar welded to the support arm. The High Level/Overfill Tabs are precision laser cut and are welded to ¾" nuts that are easily adjusted to desired height along a ¾-10 stainless steel all-thread.

DRAFT MARKS

- **OPERATIONS & MANUFACTURING**
  ERL offers precision cut carbon steel Draft Marks to assist with draft readings on the side of your barge. Draft Marks are constructed out of .312" Carbon Steel plate (.25" stainless steel as an option) and are precision laser cut to ensure a consistent size. Draft Marks are standard 6" in height however ERL can customize a size according to customers preferences.



SAMPLER BALL VALVES

PORTABLE GAUGING SYSTEMS

VAPOR CONTROL VALVES

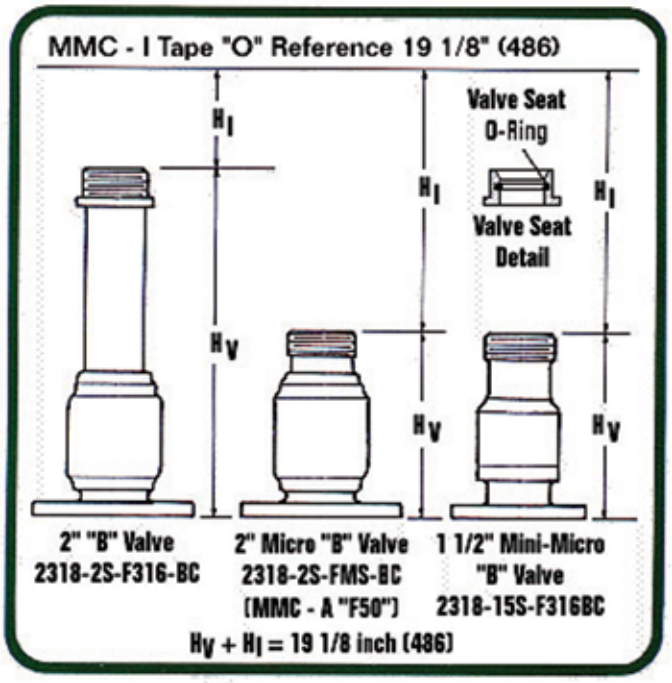
The B-type vapor control valve is available in four models. The original B-type, micro "B" and MMC (Asia) F50 are 2-inch (50) full-bore ball valves. The Mini Micro "B" is a 1 ½-inch (38) which is extremely cost-effective. All valves are flanged for ease in installation and very accurate positioning. The materials of construction are 316SS with bronze cap. The ball valves have Teflon seals. 1/2 liter sampling in both sizes is available by using MMC sampling tapes. All gauging tapes fit directly into the valve.

SPECIFICATIONS

MATERIAL:
316 Stainless steel with bronze cap* Ball valve seals - Teflon™. All other seals Viton as standard.
*Stainless steel cap available.

MOUNTING FLANGE DIMENSIONS:
1.) 2" "B" Valve (2318-2S-F316-BC) - 6" (152) O.D., BC 4 3/4" (121)
2" Micro "B" Valve (2318-2S-FMS-BC) - Bolt holes 4 3/4" (19)
2.) 1-1/2" Mini Micro "B" (2318-2S-F316BC) - 5" (127) O.D., BC 3 7/8" (98) - Bolt holes 4 5/8" (16)
3.) F50 50mm (2") MMC-A Valve -155mm (6.1") O.D., BC 120mm (4.72") - Bolt holes (4) 19 (0.75")

ESTIMATED WEIGHTS:
1.) 2" "B" Valve (2318-2S-F316-BC) ..... 14 lb. (6.35 kg)
2.) 2" Micro"B" Valve (2318-2S-FMS-BC) ..... 13 lb. (5.9 kg)
3.) 1-1/2" Mini Micro "B" (2318-2S-F316BC) ..... 9 lb. (4.1 kg)
4.) F50 50mm 2" MMC-A Valve ..... 9 kg (19.8 lbs.)



Model	HV	HI	HV &HI
2318-2S-F316BC 2" "B" Valve	13 1/8	6	19 1/8
2" Flange-6" O.D. (4 3/4 BC-[4] 3/4" Holes)	(333)	(152)	(486)
2318-2S-FMS-BC BC-2" Micro "B"	7	12 1/8	19 1/8
2" Flange-6" O.D. (4 3/4 BC-[4] 3/4" Holes)	(178)	(308)	(486)
F50 2" MMC-A Valve JIS 10K	(178)	(322)	(500)
50 Flange-155 O.D. (120) BC-4 Holes (19)	7	12 1/8	19 1/8
2318-1.5S-F316BC 1 1/2" Mini Micro "B"	7	12 1/8	19 1/8
1 1/2" Flange-5" O.D. (3 7/8 BC-[4] 5/8" Holes)	(178)	(308)	(486)

VAPOR CONTROL VALVES

FEATURE NOTES:

1) Gauging tape and sensor anti-static coated.
2) Positive internal tape stop on rewind.
3) Tape is color marked to insure full rewind position. Tape direction and motion easily seen.
4) Sight glass easily removable for cleaning or replacement. Tempered glass used.
5) Internal reel stop to prevent backward tape rewind.
6) Coiled expansion type grounding cable with large alligator clip. Standard Supply
7) Interchangeable barrels are available for all MMC Vapor Valves. A, B, MB, MMB, S, and K series. Mating barrels for competitive valves are also available.
8) Molded storage case is standard supply. Includes instruction manual and spare battery.

Closed Tape is shown connected to MMC Micro "B" valve.

FLEXI-DIP

GAS-TIGHT TRIPLE-FUNCTION PORTABLE GAUGING TAPE

The Closed Flexi-Dip™ (measuring tape) is battery-operated and intrinsically safe. When installed in avapor control valve mounted on a storage (cargo) tank, it forms a tightly sealed system that prevents toxic vapors from escaping and constitutes a closed gaiging system for that tank. The tape is marked in Metric or English unitsand is anti-static coated (as is the sensor). The tape is appropriately marked to show tape direction and motion easily, and to ensure the full rewind position. A coiledgrounding cable with large alligator clip is supplied as standard. This Closed system is recognized by many worlwide regulatory bodies as equivalent to a fixed gauging system if the tape remains in the valve for the duration of the cargo handling operation.

SPECIFICATIONS

ACCURACY OF TAPE READING:
fluid level= +/- 1/8 inch (3mm)

BATTERY:
9 volt Eveready #522 or Mallory MN1604

AMBIENT TEMPERATURE LIMITS:
-20°F (-7°C) to 120°F (49°C)

PRODUCT TEMPERATURE LIMITS:
-40°F (-40°C) to 180°F (82°C)

TAPE LENGTHS:
50 ft. (15m), 75 ft. (25m), 100 ft. (30m)

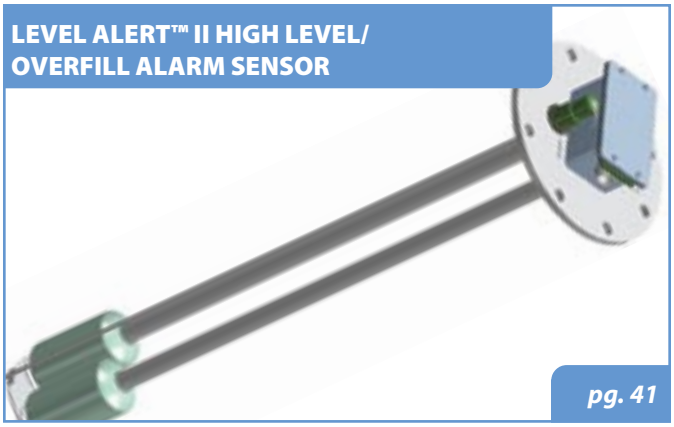
TYPICAL WEIGHTS:
14 lbs. (6.4KG)

PRESSURE LIMITS:
3 psi working, 7.5 psi maximum

APPROVALS:
Intrinsically safe, FM, BASEEFA, CSA, SAA

SECTION 02 OVERFILL PROTECTION PRODUCTS

LEVEL ALERT™ II HIGH LEVEL/ OVERFILL ALARM SENSOR



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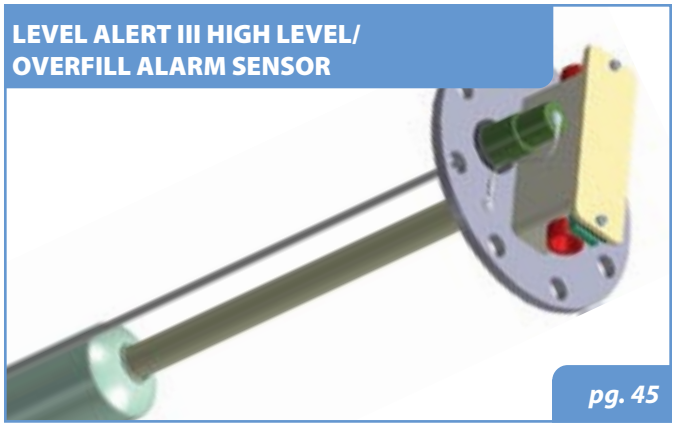
LEVEL ALERT III HIGH LEVEL/ OVERFILL ALARM SENSOR



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HIGH LEVEL/OVERFILL SYSTEM ACC.

pg. 46

APM-1™ PORTABLE ALARM PANEL

pg. 52

APM-1B LITE

pg. 54

APM-2™ FIXED ALARM PANEL

pg. 56

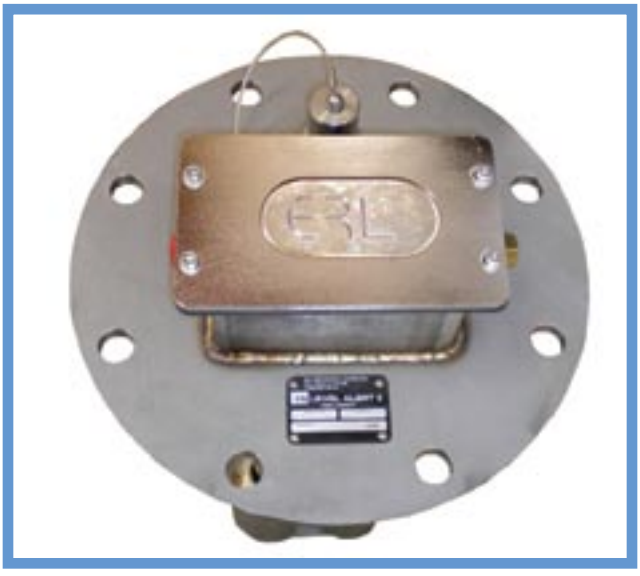
SUPERAC™ MODEL III 12" ROUND MARINE SAFETY RELIEF VALVE (SPILL VALVE)

pg. 62

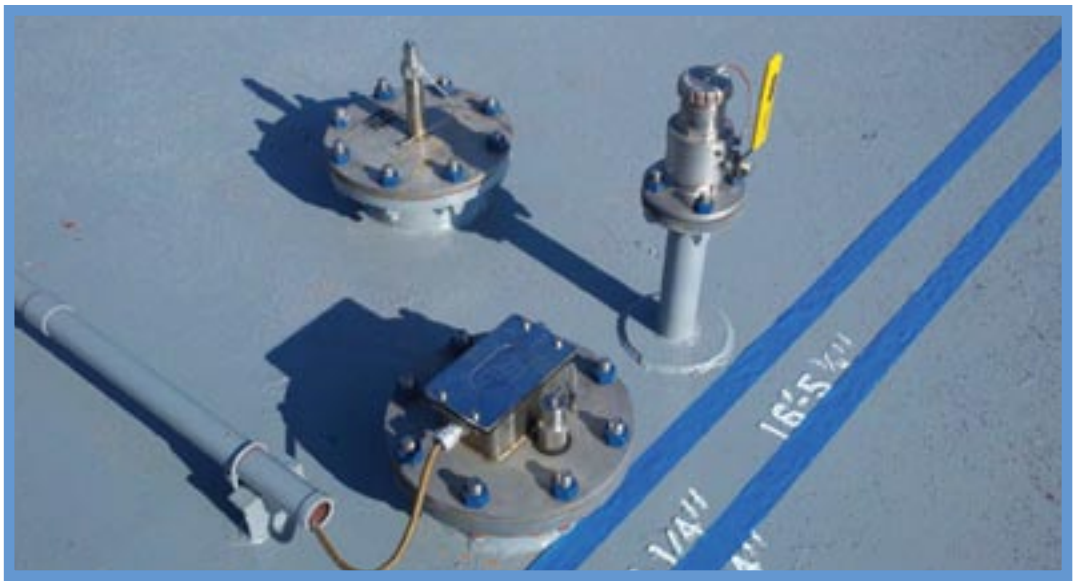
APM-2™ High Level/Overfill Alarm Annunciator Panel for a three compartment barge.

LEVEL ALERT II High Level/Overfill Liquid Level Alarm Sensor Installed.

BTS-1 Barge-to-Shore Connector with BCS-001 located on outside of Hubbell weather tight box.



LEVEL ALERT MODEL II™ High Level/Overfill Liquid Level Alarm Sensor.



LEVEL ALERT MODEL II™ High Level/Overfill Liquid Level Alarm
Sensor, Sampler Ball Valve and DS-39™ One Meter Rising Stick Gauge.

DS-39TM One Meter Rising Stick Gauge, Sampler Ball Valve, 2.5" Equate PV Valve,
and SGM-1 Full View Sight Glass.

EXCERPTS FROM FEDERAL REGISTER

PART 11 - Dept. of Transportation - Coast Guard - June 21,1990

46CFR Part 39 Vapor Control Systems
Subpart 39.20 Design and Equipment
§ 39.20-7 Tankship liquid overfill protection -T/ALL

The following section, reprinted here for your convenience, contains the USCG rules and regulations regarding overfill protection.

39.20-7 Tankship liquid overfill protection-T/ALL

(a) Each cargo tank of a tankship must be equipped with an intrinsically safe high level alarm and a tank overfill alarm.

(b) The high level alarm and tank overfill alarm required by paragraph (a) of this section, if installed after July 23, 1990 must:

(1) Be independent of each other;

(2) Alarm in the event of loss of power to the alarm system or failure of electrical circuitry to the tank level sensor; and

(3) Be able to be checked at the tank for proper operation prior to each transfer or contain an electronic self- testing feature which monitors the condition of the alarm circuitry and sensor.

(c) The high level alarm required by paragraph (a) of this section must:

(1) Alarm before the tank overfill alarm, but no lower than 95 percent of tank capacity;

(2) Be identified with the legend “High Level Alarm” in black letters at least 50 millimeters (2 inches) high on a white background; and

(3) Have audible and visible alarm indications that can be seen and heard on the vessel where cargo transfer is controlled.

(d) The tank overfill alarm required by paragraph (a) of this section must:

(1) Be independent of the cargo gauging system;

(2) Have audible and visible alarm indications that can be seen and heard on the vessel where cargo transfer is controlled and in the cargo deck area;

EXCERPTS FROM FEDERAL REGISTER

PART 11 - Dept. of Transportation - Coast Guard - June 21,1990

46CFR Part 39 Vapor Control Systems
Subpart 39.20 Design and Equipment
§ 39.20-7 Tankship liquid overfill protection -T/ALL *(continued)*

OVERFILL PROTECTION *(continued)*

(3) Be identified with the legend "TANK OVERFILL ALARM" in black letters at least 50 millimeters (2 inches) high on a white background; and

(4) Alarm early enough to allow the person in charge of transfer operations to stop the transfer operation before the cargo tank overflows.

(e) If a spill valve is installed on a cargo tank fitted with a vapor collection system, it must meet the requirements of Sec. 39.20-9(c) of this part.

(f) If a rupture disk is installed on a cargo tank fitted with a vapor collection system, it must meet the requirements of Sec.

39.20-9 (d) of this part. 39.20-9 Tank barge liquid overfill protection-B/ALL

Each cargo tank of a tank barge must have one the following liquid overfill protection arrangements.

(a) A system meeting the requirements of 39.20-7 of this part which:

(1) Includes a self-contained power supply; "The APM-2 Annunciator Panel connected to ERL Liquid Level Sensors satisfy this requirement."

(2) Is powered by generators installed on the barge; or

(3) Receives power from a facility and is fitted with a shore tie cable and a 120 volt 20 amp explosion proof plug which meets:

(i) ANSI/NEMA WD6;
(ii) NFPA 70, Articles 410-57 and 501-12; and
(iii) 111.105-9 of this chapter.

(b) An intrinsically safe overfill control system which: "ERL Liquid Level Sensors satisfy this requirement."

(1) Is independent of the cargo gauging device required, by 39.20-3(a) of this part;

(2) Actuates an alarm and automatic shutdown system at the facility overfill control panel, or on the vessel to be lightered if a lightering operation, 60 seconds before the tank becomes 100 % liquid full;

(3) Is able to be checked at the tank for proper operation prior to each loading;

EXCERPTS FROM FEDERAL REGISTER

PART 11 - Dept. of Transportation - Coast Guard - June 21,1990

46CFR Part 39 Vapor Control Systems
Subpart 39.20 Design and Equipment
§ 39.20-7 Tankship liquid overfill protection -T/ALL *(continued)*

OVERFILL PROTECTION *(continued)*

(4) Consists of components which, individually or in series, will not generate or store a total of more than 1.2 V, 0.1 A, 25 mW, or 20 microjoules;

(5) Has at least one tank overfill sensor switch with normally closed contacts per cargo tank;

(6) Has all tank overfill sensor switches connected in series;

(7) Has interconnecting cabling that meets 111.105-15(b) of this chapter; and

(8) Has a male plug with a 5 wire, 16 amp connector body meeting IEC 309-1/309-2 which is:

(i) Configured with pins S2(L2) and Rl(LI) for the tank overfill sensor circuit, pin G connected to the cabling shield, and pins N and T3(L3) reserved for an optional high level alarm circuit meeting the requirements of this paragraph; and
(ii) Labeled "Connector for Barge Overflow Control System" and with the total inductance and capacitance of the connected switches and cabling. "API Recommended Practice 1125 also applies to the wiring of Liquid Level Sensors."

(c) A spill valve which:

(1) Meets ASTM F1271;

(2) Relieves at a pressure higher than the pressure at which the pressure relief valves meeting the requirements of 39.20-11 operate;

(3) Limits the maximum pressure at the cargo tank top during liquid overfill, at the maximum loading rate for the tank, to not more than the maximum design working pressure for the tank; and

(4) If the vessel is in ocean or coastwise service, has provisions to prevent opening due to cargo sloshing.

(d) A rupture disk arrangement which meets paragraphs (c) (2), (c) (3) and (c) (4) of this section and is approved by the Commandant (G-MSO).

API RECOMMENDED PRACTICE 1125

2.2.2 Tank barge level sensor circuits (or sensor relay circuits, for systems which also meet the requirements of 46 CFR 39.20-7) should have normally closed contacts and be grounded by connecting the barge cable shield to the ground pin of the connector.

2.2.3 The total connected inductance and capacitance of switches and cabling aboard the barge should not exceed 0.6 mH (inductance) or 0.18 gF (capacitance) at 20.66 volts DC/155 mA. The length of connected cable on the barge should not exceed 3000 feet.

2.3 TERMINALS

2.3.1 Terminals should determine the best option for interfacing the barge/terminal connection system with their emergency shutdown system (intrinsically safe electrical, fiber optic, radio, or pneumatic means may be technically feasible). Whatever interface system is used by the terminal, the barge/terminal connection system must be intrinsically safe electrical and the integrated barge/terminal system should permit an overfill protection signal on the barge to activate the terminal emergency shutdown system without delay.

2.3.2 The ground pin on the terminal's plug should be connected to the terminal cable shield which should be grounded at the overfill protection control panel.

2.3.3. The intrinsically safe associated apparatus of the terminal's overfill protection control panel should be designed within the following constraints:

1. Maximum length of terminal cable (panel to connector): 1000 feet.
2. Maximum output voltage (panel): 20.66 volts DC.
3. Maximum output current (panel): 155 mA.
4. Maximum allowable connected inductance (barge circuit): 0.6 mH.
5. Maximum allowable connected capacitance (barge circuit): 0.18 pF.

2.4 ELECTRICAL CONNECTION

2.4.1 TANK BARGES
Tank barges should provide a mechanically protected, shielded multicable 2x18 AWG minimum (or U18 AWG minimum if optional high level system is used) with an oil and seawater resistant jacket, terminating in a fixed, male, 5-wire, earthing-contact position 1, 16 amp inlet meeting IEC 309-1/309-2, located within 10 feet of the barge cargo loading manifolds (port and starboard). The inlet should be clearly labeled as follows:

API RECOMMENDED PRACTICE 1125 *(continued)*

BARGE OVERFILL CONTROL SYS. CONNECTOR

MAX. INPUT VOLTAGE: 20.66 V DC MAX. INPUT CURRENT: 155 mA
TOTAL CONNECTED INDUCTANCE: _____ mH
TOTAL CONNECTED CAPACITANCE: _____ µF
NOTE: The values to be inserted for total connected inductance and capacitance apply to switches
and cabling aboard the barge.

2.4.2 TERMINALS
Terminals should provide a mechanically protected, shielded, flexible cable 2 x18 AWG minimum or 4x18 AWG minimum if optional high level alarm system is used with an oil and seawater resistant jacket, terminating in a female, 5-wire, earthing-contact position 1, 16 amp connector meeting IEC 309-1/309-2. The terminal should provide cable to reach the fixed male connector at the barge manifold with sufficient excess to allow for changing draft, water depth and mooring conditions. The connector should be clearly labeled as follows:

BARGE OVERFILL CONTROL SYS. CONNECTOR

MAX. OUTPUT VOLTAGE: _____ VDC
MAX. OUTPUT CURRENT: _____ mA
MAX. ALLOWABLE CONNECTED INDUCTANCE: 0.6 mH
MAX. ALLOWABLE CONNECTED CAPACITANCE: 0.18 _____ (µF)
NOTE: The values to be inserted for maximum output voltage and current apply to the intrinsically safe associated apparatus of the terminal's overfill control panel.

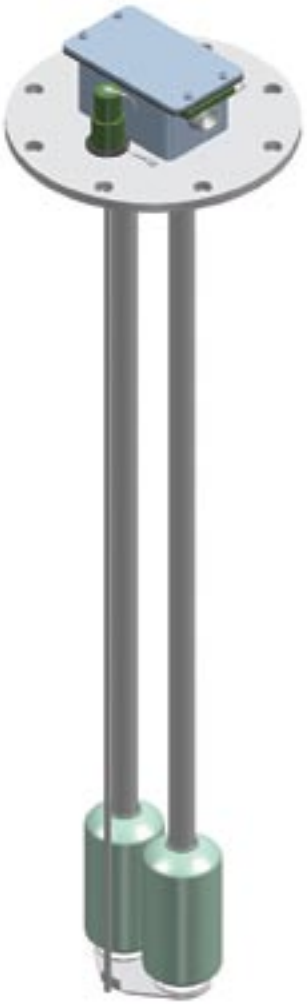
2.4.3 CONNECTOR PIN ASSIGNMENTS
Pins N and T3 (L3) are reserved for optional high level alarm connection; pins S2 (L2) and RI(LI) are reserved for emergency shutdown system connections. Pin G (unlabeled in Figure 1) should be connected to the barge cable shield or the terminal cable shield, respectively. Designations N, T, S and R are those found in the current Code of Federal Regulations. Designations shown in parentheses and on Figure 1 are those in the 1989 revision of IEC 309-2.

2.4.4 OPERATIONS
A tank barge's overfill control system should not be Used if its inductance or capacitance exceeds the terminal's design limitations or if the terminal's output voltage or current exceeds the barge's design limitations.

LIQUID LEVEL CONTROL SYSTEM

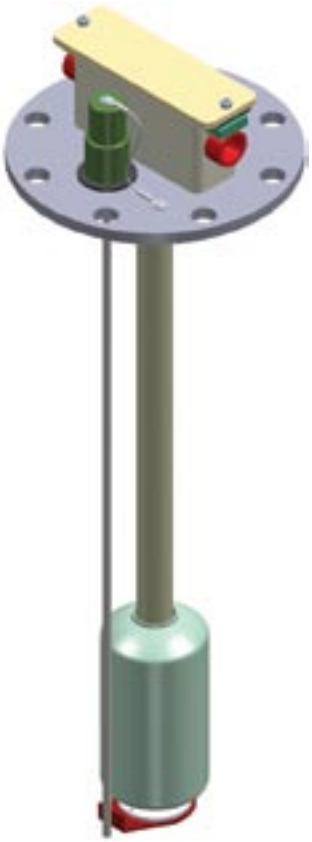
ERL manufactures various types of LEVEL ALERT™ Liquid Level Sensors which provide reliable high level and overfill protection in accordance with 46 CFR 39.20-9 (b).

LEVEL ALERT MODEL II



Dual Action float with Test Handle.

LEVEL ALERT MODEL III

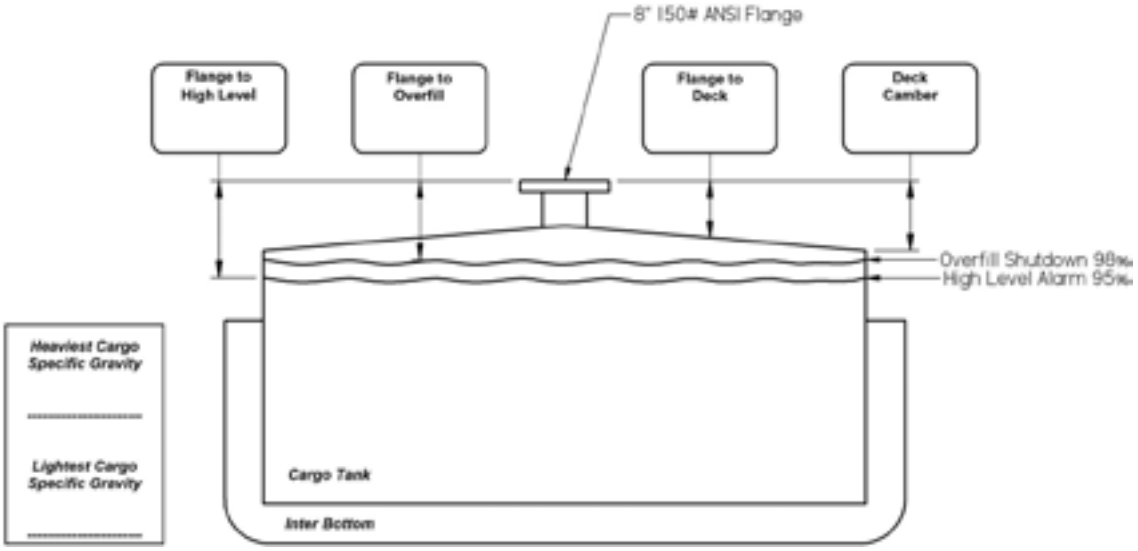


Linear action single float with Test Handle.

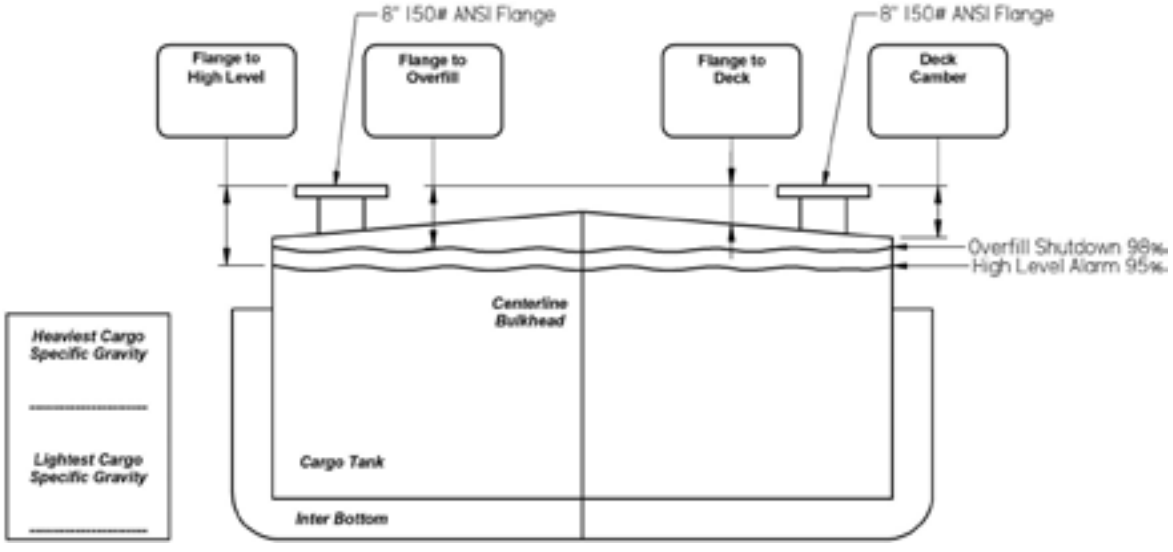
• We manufacture different types of Liquid Level Sensors, because not all cargos and all vessel requirements are the same. Each type offers unique advantages for different cargos and different vessel configurations. All ERL Liquid Level Sensors are 100% compatible with all other ERL Liquid Level Control System Components and will integrate seamlessly no matter what your particular needs are. The following pages describe the various components of the ERL Liquid Level Control System.

HIGH LEVEL AND OVERFILL LIQUID LEVEL SENSOR DIMENSIONS

When ordering ERL Liquid Level Alarm Sensors, please provide the dimensional information indicated on the appropriate barge diagram below. This information is necessary to insure that your alarm sensors are manufactured to function at the correct high level and overfill depth settings to adequately protect your crew, cargo and barge. This information should be provided by the engineer who submitted the barge's plans to the Coast Guard. Also, specify the Specific Gravity range (highest and lowest specific gravities) of the cargos being transported in each barge for which you are ordering alarms. All factory alarm settings are relative to a specific gravity of 1.0 S.G.



Barge Cross-Section without Centerline Bulkhead



Barge Cross-Section with Centerline Bulkhead

HIGH LEVEL/OVERFILL LIQUID LEVEL ALARM SENSORS
LEVEL ALERT MODEL II™

- **FULL REGULATORY COMPLIANCE**
  ERL's Level Alert Model II High Level/Overfill Liquid Level Sensor is U.S. Coast Guard accepted and satisfies the requirements of 46 CFR 39.20 - 9 (b). Level Alert sensors are suitable for use on A.B.C. classed vessels.

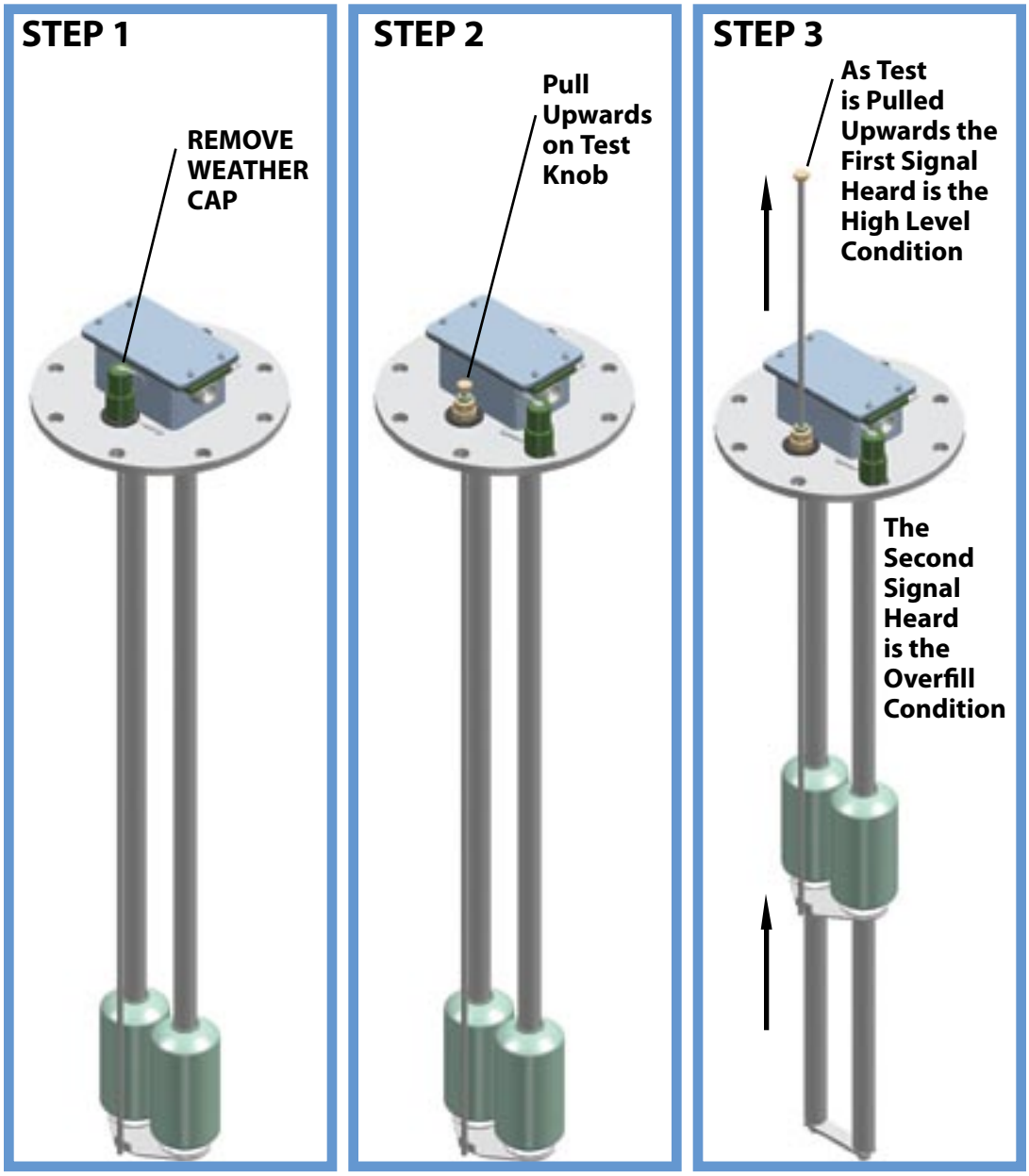
- **SIMPLE, RELIABLE OPERATION**
  Stainless steel linear slide floats actuate the liquid level switches. The high level switch actuates (opens) when the cargo compartment is 95% full. Subsequently the overfill switch actuates (opens) when the cargo compartment is 98% full. With the Level Alert Model II Liquid Level Sensor connected to the loading dock's alarm/shutdown system and/or to barge mounted alarm annunciator panel, the risk of overfill spills are significantly reduced.

- **QUALITY CONSTRUCTION**
  All stainless steel heavy duty construction insures extended service in harsh marine applications. Premium ALNICO magnets are tested and matched to ERL's UL approved reed switches for long term reliable operation. Each sensor is 100% operationally tested prior to shipment.

- **EASY INSTALLATION**
  Level Alert sensors easily bolt to standard 8" 150 lb. class mounting flanges which are 13.5" diameter with 8-bolt holes 0.88" diameter on a 11.75" diameter bolt circle. The floats can pass through a 7" diameter, or greater, deck opening. The 8" mounting nozzle is typically 6" high and is located at, or near, the geometric center of the cargo compartment. ERL can provide, as optional extras, pre-fabricated mounting nozzles, gaskets and stainless steel bolt sets.

HIGH LEVEL/OVERFILL LIQUID LEVEL ALARM SENSORS LEVEL ALERT MODEL II ™ OPERATIONAL TEST PROCEDURES

IMPORTANT: These instructions must be included in transfer procedures of all vessels so equipped. The Test Procedure outlined below must be performed on ALL High Level/Overfill Alarm Sensors prior to EVERY vessel loading per 46 CFR 39.20-9(b)3.

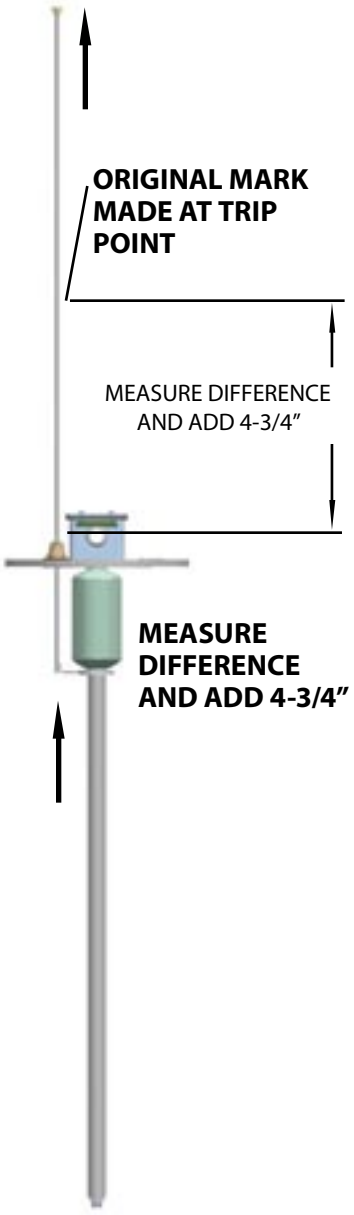


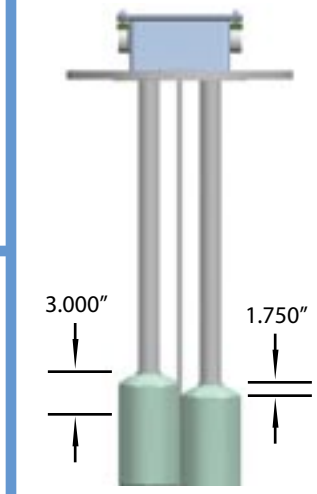
HIGH LEVEL/OVERFILL LIQUID LEVEL ALARM SENSORS
LEVEL ALERT MODEL II ™ LEVEL SET POINT CHECK PROCEDURE

STEP 1

STEP 2

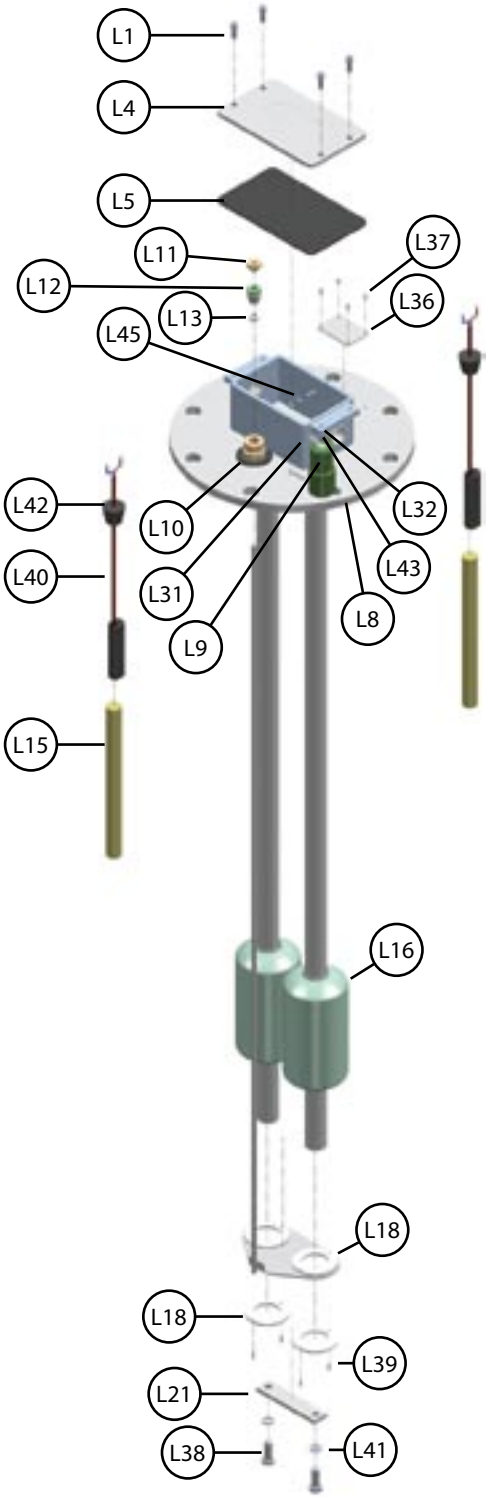
RAISE TEST ROD AS HIGH AS POSSIBLE. MEASURE THE DIFFERENCE BETWEEN THE MARK MADE AT THE TRIP POINT AND WITH TEST ROD FULLY RAISED. ADD 4-3/4" TO THIS MEASUREMENT TO FIND THE ALARMS SET POINT FROM FLANGE DOWN TO THE LIQUID. DO ONCE FOR "HIGH LEVEL" AND ONCE FOR "OVERFILL" SETTING



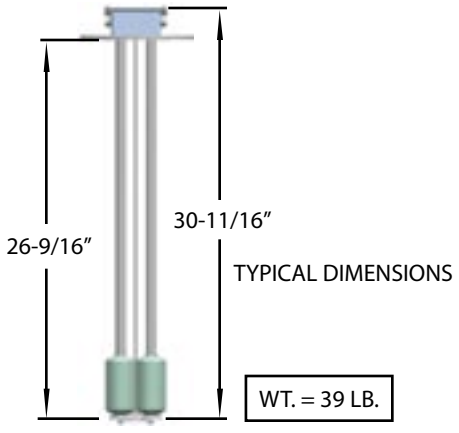


SPECIFIC GRAVITY

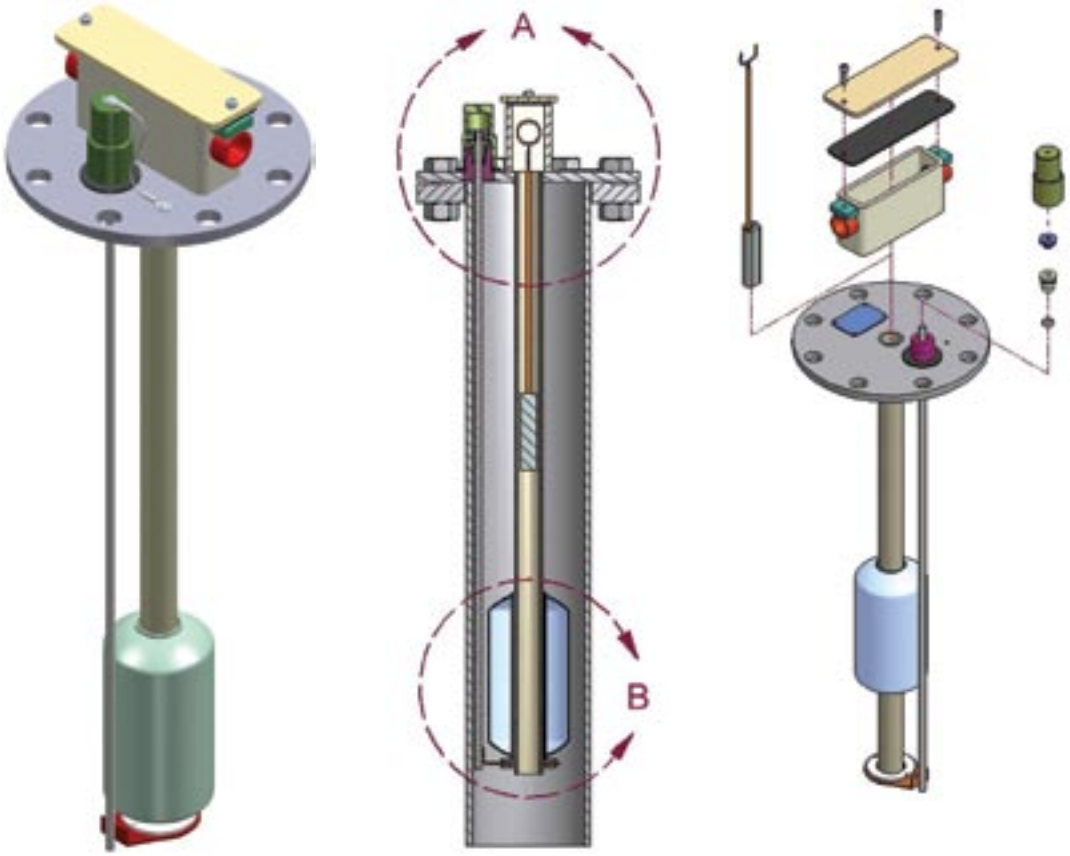
HIGH LEVEL/OVERFILL LIQUID LEVEL ALARM SENSORS
LEVEL ALERT MODEL II ™ ASSEMBLY DRAWING



Item No.	Item Name	QTY.
L1	SHCS 1/4-20 x 3/4	4
L4	Junction Box Lid	1
L5	Lid Gasket	1
L8	Mounting Flange	1
L9	Cap	1
L10	Gasket	1
L11	Test Knob	1
L12	Test Rod Guide Bushing	1
L13	Teflon Bushing	1
L15	Spacer	2
L16	Float	2
L18	Test Plate Bumper	4
L19	Test Rod	1
L21	Strap	1
L31	Lanyard	1
L32	Drive Screw	2
L36	ID Tag	1
L37	Drive Screw	4
L38	Hex Head Bolt	2
L39	Rivit	4
L40	Switch Assm.	2
L41	Lockwasher	2
L42	Switch Assm. Plug	2
L43	Washer	1
L45	Hex Nut	2



HIGH LEVEL/OVERFILL LIQUID LEVEL ALARM SENSORS
LEVEL ALERT™ MODEL E-III



- **FULL REGULATORY COMPLIANCE**
  ERL's Level Alert Model E-III High Level/Overfill Liquid Level Sensor is U.S. Coast Guard accepted and satisfies the requirements of 46 CFR 39.20 - 9 (b). Level Alert sensors are suitable for use on A.B.C. classed vessels.

- **SIMPLE OPERATION**
  A single stainless steel linear slide float actuates (opens) Liquid Level Switches on common tube as liquid rises.

- **QUALITY CONSTRUCTION**
  All 300 series stainless steel construction insures extended service life. Premium ALNICO float magnets are tested and matched to ERL's UL Approved Reed Switches for long term reliable operation. Each sensor is 100% operationally tested prior to shipment.

- **EASY INSTALLATION**
  The Level Alert E-III bolts to standard 5" 150 lb. class mounting flange which is 11.0" diameter and has (8) 0.88" diameter bolt hole on a 9.5" diameter bolt circle. The floats passing through a 5" diameter deck opening.

LIQUID LEVEL CONTROL SYSTEM
SYSTEM ACCESSORIES (Per 46 CFR 39.20 – 9 (b)

Barge-to-Shore Receptacles

BTS-1 – HUBBELL receptacle, Junction Box, Enclosure, and BCS-001 sticker.
2 required – 1 Port and 1 Starboard

BTS-2 – HUBBELL receptacle, Junction Box, and cap.
2 required – 1 Port & 1 Starboard

BTS-3 – HUBBELL receptacle, Junction Box, and cap.
2 required – 1 Port & 1 Starboard

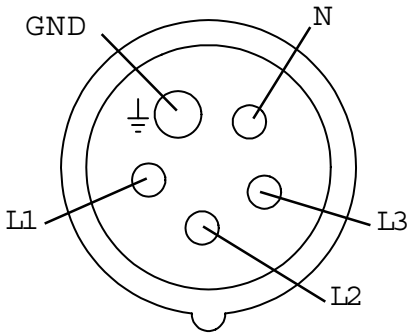
Shore-to-Barge Plug

Item 516P

Item 516C

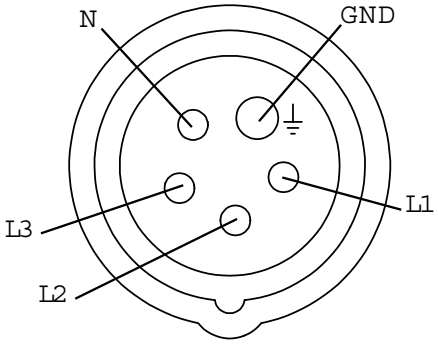
HUBBELL PLUGS – item 516C with weather cover is the standard connector for our APM-1.

BARGE CONNECTOR SIGN - BCS-001
Designed to identify the location of the barge overfill alarm system electrical connector. Dimensions: 7″ X 11″ and contains all information required including a space for the system inductance rating in millihenrys and the system capacitance in microfarads.



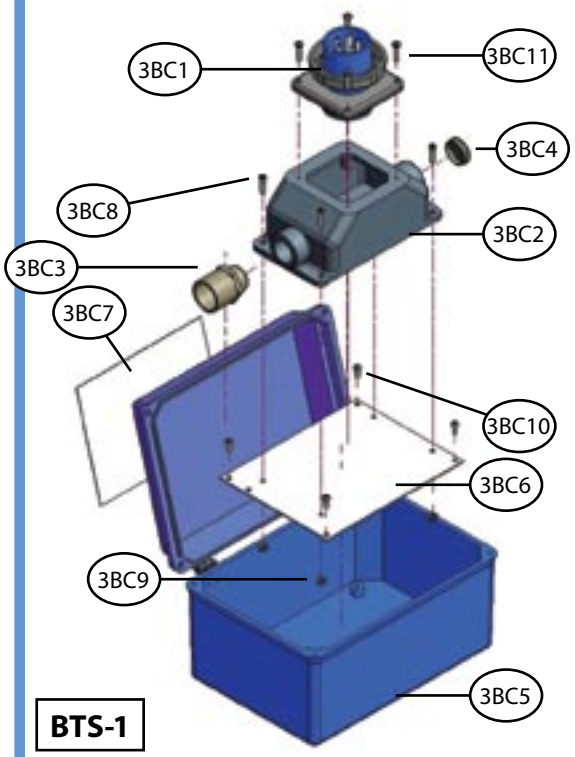
Barge Receptacle
(barge-to-shore)

Legend		
GND	=	Ground
L1	=	Overfill
L2	=	Overfill
L3	=	High Level
N	=	High Level



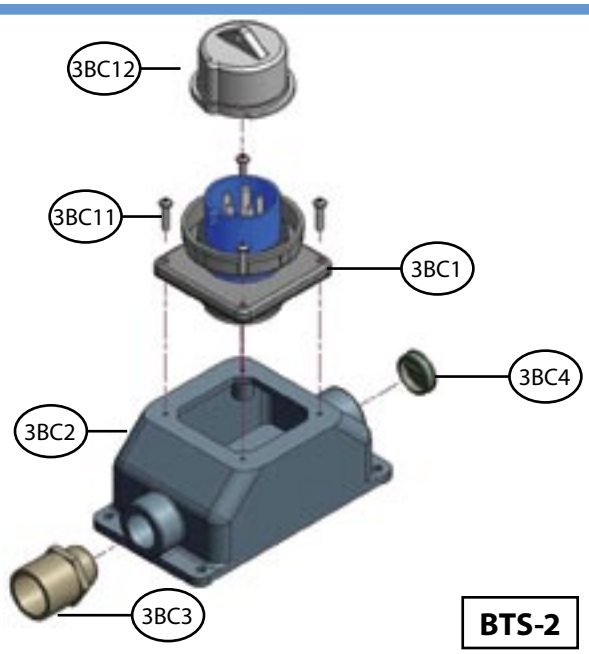
Dock/Terminal Plug
(shore-to-barge)

BARGE TO SHORE CONNECTION
BTS ASSEMBLY DRAWINGS



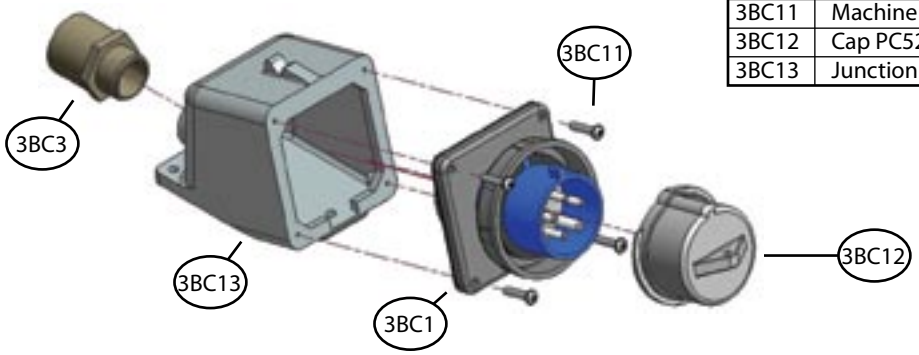
BTS-1

Item #	DESCRIPTION	QTY PER
3BC1	Receptacle 516B1W	1
3BC2	Junction Box FT302W	1
3BC3	Connector	1
3BC4	Pipe Plug, 1 Inch	1
3BC5	Enclosure	1
3BC6	Mounting Plate Hoffman A-10P8	1
3BC7	BCS-001 Sticker	1
3BC8	SHCS, 10-32 x 7/8	4
3BC9	Nylock Nut, 10-32	4
3BC10	BHCS, 10-32 x 3/8	4
3BC11	Machine Screw, 10-32 x 7/8	4



BTS-2

Item #	DESCRIPTION	QTY PER
3BC1	Receptacle 516B1W	1
3BC2	Junction Box FT302W	1
3BC3	Connector	1
3BC4	Pipe Plug, 1 Inch	1
3BC11	Machine Screw, 10-32 x 7/8	4
3BC12	Cap PC520	1



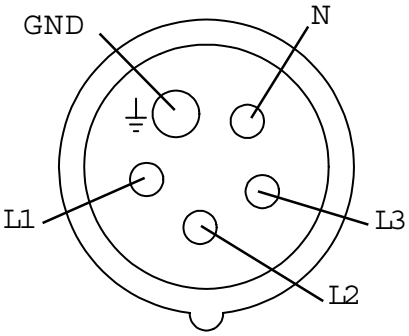
Item #	DESCRIPTION	QTY PER
3BC1	Receptacle 516B1W	1
3BC3	Connector	1
3BC11	Machine Screw, 10-32 x 7/8	4
3BC12	Cap PC520	1
3BC13	Junction Box BB201W	1

BTS-3

TYPICAL SERIES WIRING DIAGRAMS

Per 46 CFR 39.20 - 9 (b) 6

Installation practices per 46 CFR Part 111.105 for hazardous locations must be followed as well as API 1125. Recommended wire is TPS16TIB-1; 2-Conductor, 16 Gauge, bronze armor, foil shield with 20 gauge ground wire or equal.

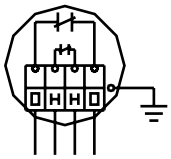


Barge Receptacle
(barge-to-shore)

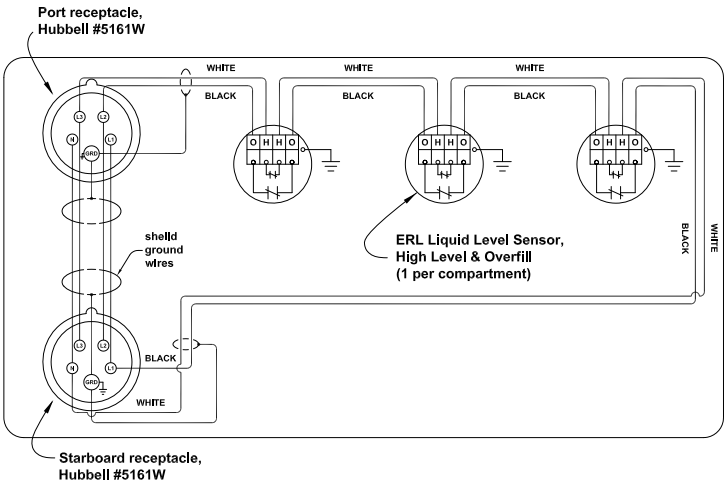
Legend		
GND	=	Ground
L1	=	Overfill
L2	=	Overfill
L3	=	High Level
N	=	High Level

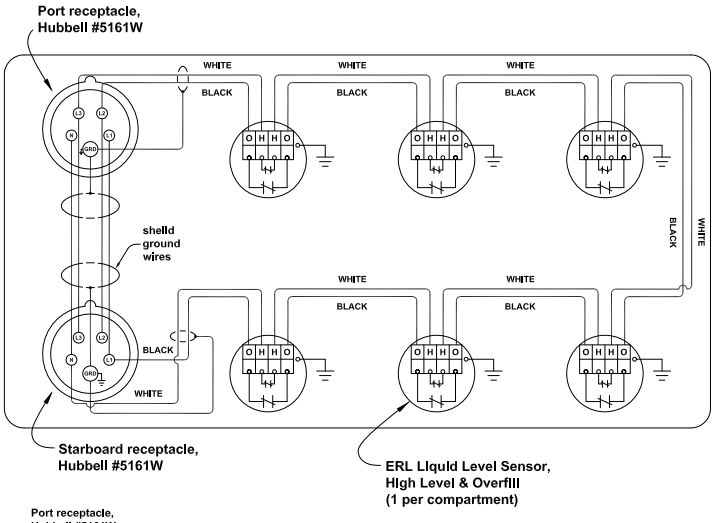
CONNECT HUBBELL RECEPTACLE GROUND TO HULL

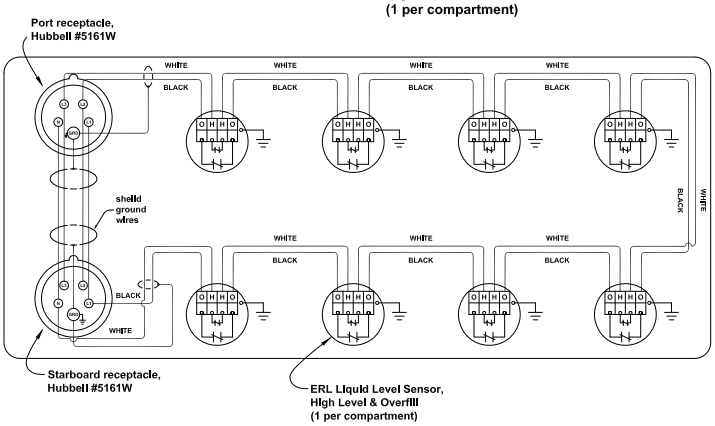
REED SWITCH
UL APPROVAL NO. E122752 (N)
CAPACITANCE 0.2 PICO FARADS INDUCTANCE 0



FIELD CONNECTION TO SENSOR





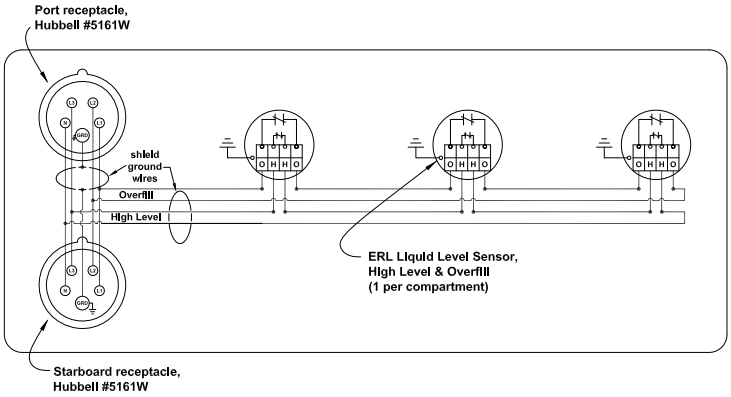


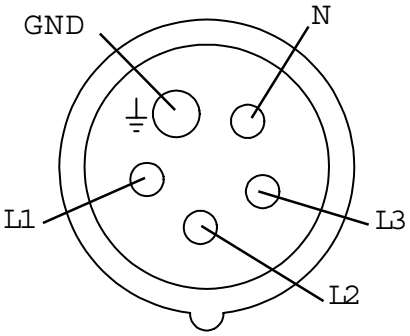
* BARGE TO SHORE HUBBELL RECEPTACLES MUST BE LOCATED WITHIN 10 FEET OF CARGO LOADING MANIFOLDS (PORT AND STARBOARD).

TYPICAL SERIES WIRING DIAGRAMS

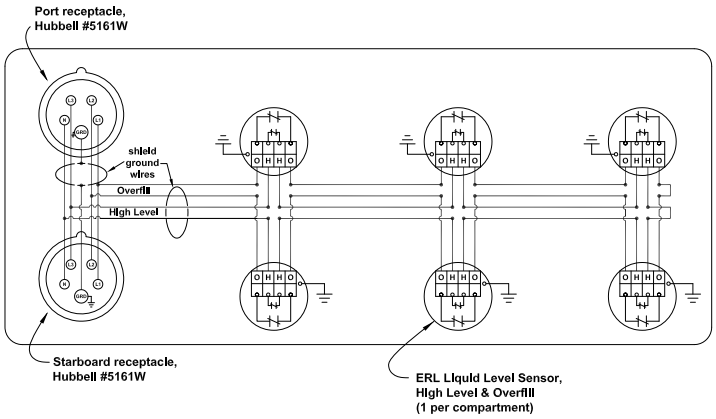
Per 46 CFR 39.20 - 9 (b) 6

Installation practices per 46 CFR Part 111.105 for hazardous locations must be followed as well as API 1125. Recommended wire is TPS16TIB-1; 2-Conductor, 16 Gauge, bronze armor, foil shield with 20 gauge ground wire or equal.





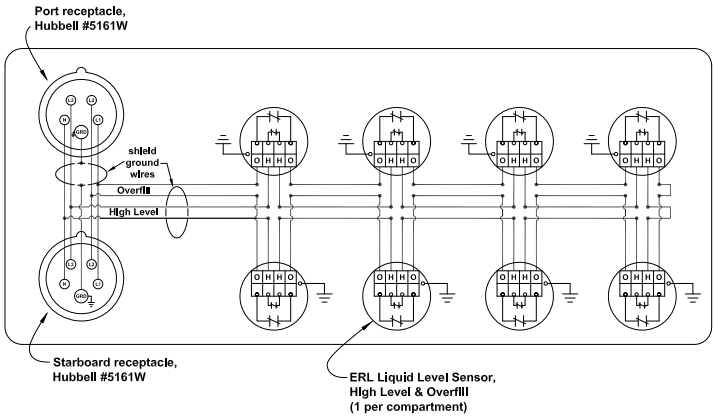
Barge Receptacle
(barge-to-shore)



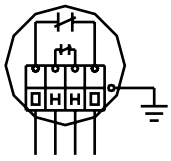
Legend

GND	=	Ground
L1	=	Overfill
L2	=	Overfill
L3	=	High Level
N	=	High Level

CONNECT HUBBELL
RECEPTACLE
GROUND TO HULL

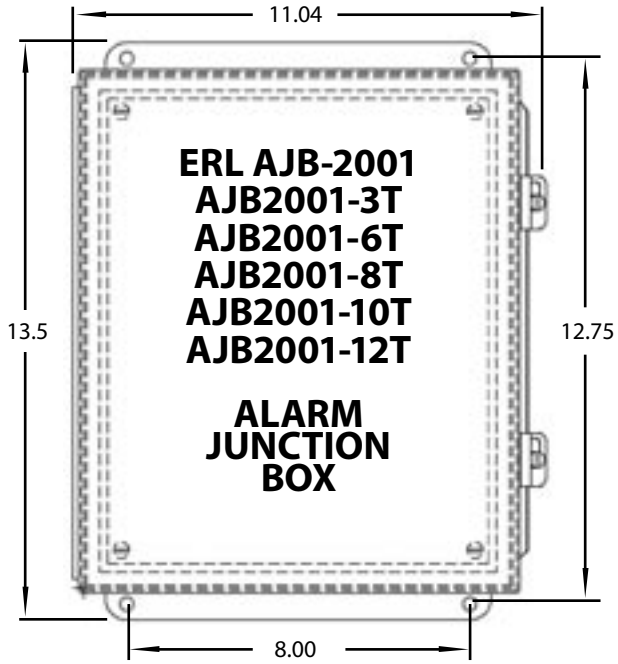


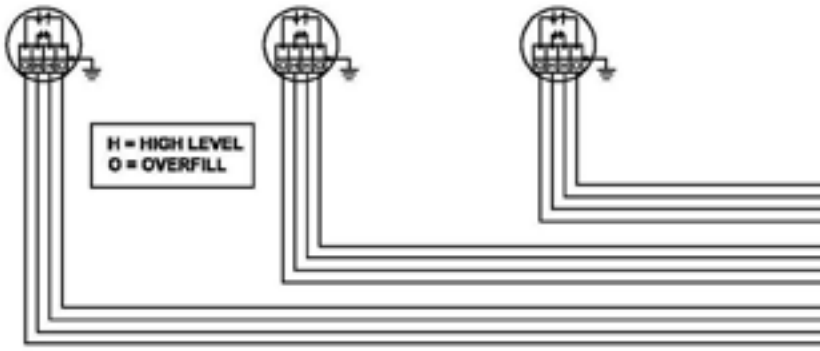
REED SWITCH
UL APPROVAL NO. E122752 (N)
CAPACITANCE 0.2 PICO
FARADS INDUCTANCE 0

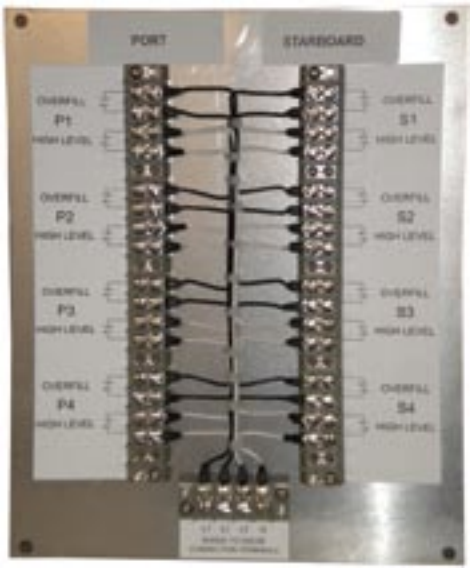


FIELD CONNECTION TO
SENSOR

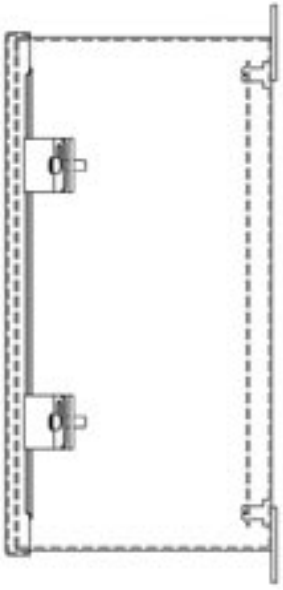
HIGH LEVEL/OVERFILL ALARM SENSOR WIRING INTERCONNECT BOX





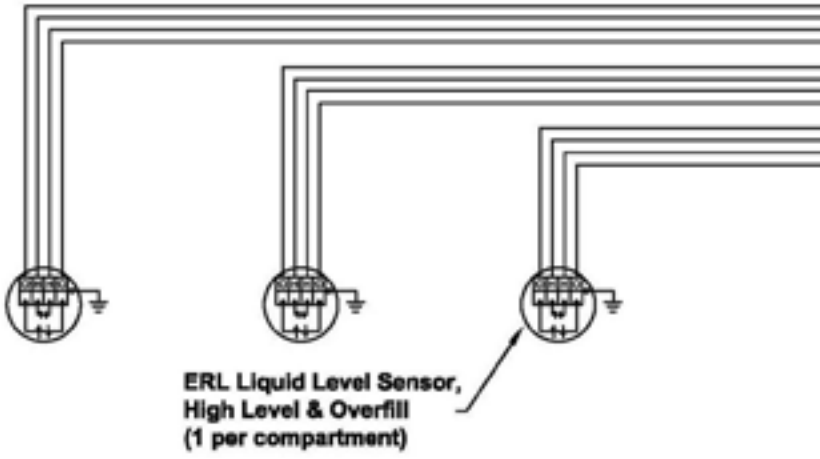


THE HIGH LEVEL/OVERFILL SENSORS ARE LOCATED IN A CLASS 1, GROUP D, HAZARDOUS LOCATION. THESE N/C CONTACTS ARE CONNECTED IN SERIES. INSTALLATION PRACTICES PER 46 CFR PART 111.105 FOR HAZARDOUS LOCATIONS MUST BE FOLLOWED AS WELL AS API 1125. RECOMMENDED WIRE IS TPS16TIB-2 OR EQUAL; 4-CONDUCTOR, 16 GAUGE, BRONZE ARMOR, FOIL SHIELD WITH 20 GAUGE GROUND WIRE OR EQUAL. FTNSIA 16 GAUGE, 4 CONDUCTOR CABLE WITH COPPER SHIELD AND ALUMINUM ARMOR. CONNECT GROUND WIRE TO HULL.

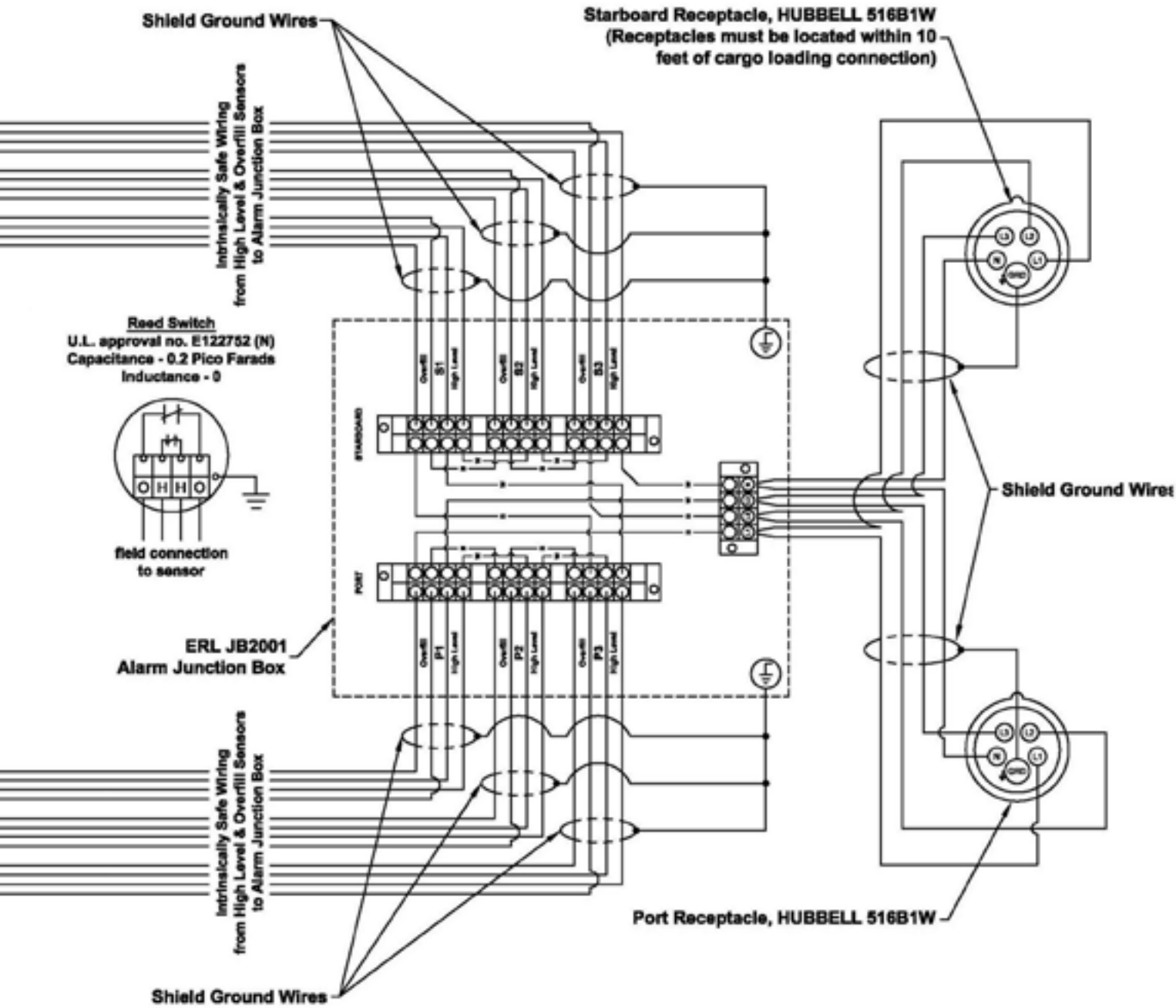


STAINLESS STEEL CONSTRUCTION

NEMA 4R



HIGH LEVEL/OVERFILL ALARM SENSOR WIRING INTERCONNECT BOX



CONNECT HUBBELL RECEPTACLE AND JUNCTION BOX GROUND TO HULL.

PORTABLE ALARM PANELS MODEL APM-1

- **PORTABLE AND COMPLETELY SELF CONTAINED**
  ERL's APM-1 is very portable, weighing only 35 lbs. A retractable handle makes the battery powered, self-contained panel, easy to carry. A voltmeter lets you monitor battery condition when the switch is in the "On" position.

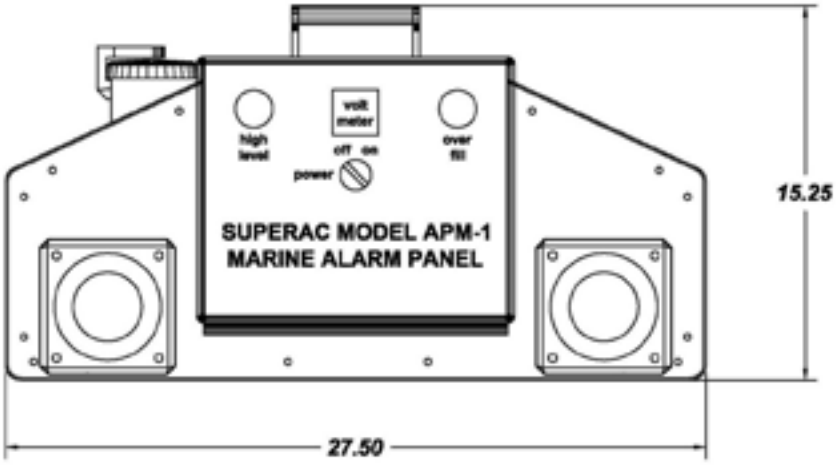
- **SAFE RELIABLE OPERATION**
  The APM-1 housing is of NEMA Type 4, weather proof construction, rated for outdoor use. All electrical components are UL, FM and CSA approved. The output of the APM-1 is intrinsically safe for connection in Class I, II and III, Division 1 and 2, Groups A-G Hazardous Locations. Because the panel is not explosion proof, the panel must be operated outside of the hazardous area on deck per 46 CFR 111.105-31. More specifically, when operated on the open deck, the panel must be at least 10 feet away from a vapor source. When operated over a cargo compartment the panel must be located at least 8 feet over the deck per 46 CFR 111.105-31 K2.

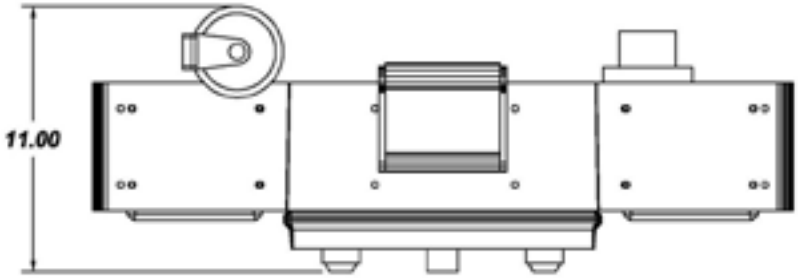
- **EASY TO OPERATE**
  Complete operating instructions are printed on the front of the panel. An 18 foot long cable with a Hubbell 516C-1W receptacle, allows for easy connection to the vessel liquid level sensor system with the panel positioned outside of the hazardous area. Brilliant indicator lights and loud 105 DBB at one meter audible alarms warn the tankerman of a high level/overfill condition over the entire deck.

PORTABLE ALARM PANELS MODEL APM-1

APM-1
WT. = 35 lbs.

Back of APM-1 showing the self-test or dock connection plug and the self-store brackets for the 18' of cord and the Hubbell connector P/N# 516 C 1 W.





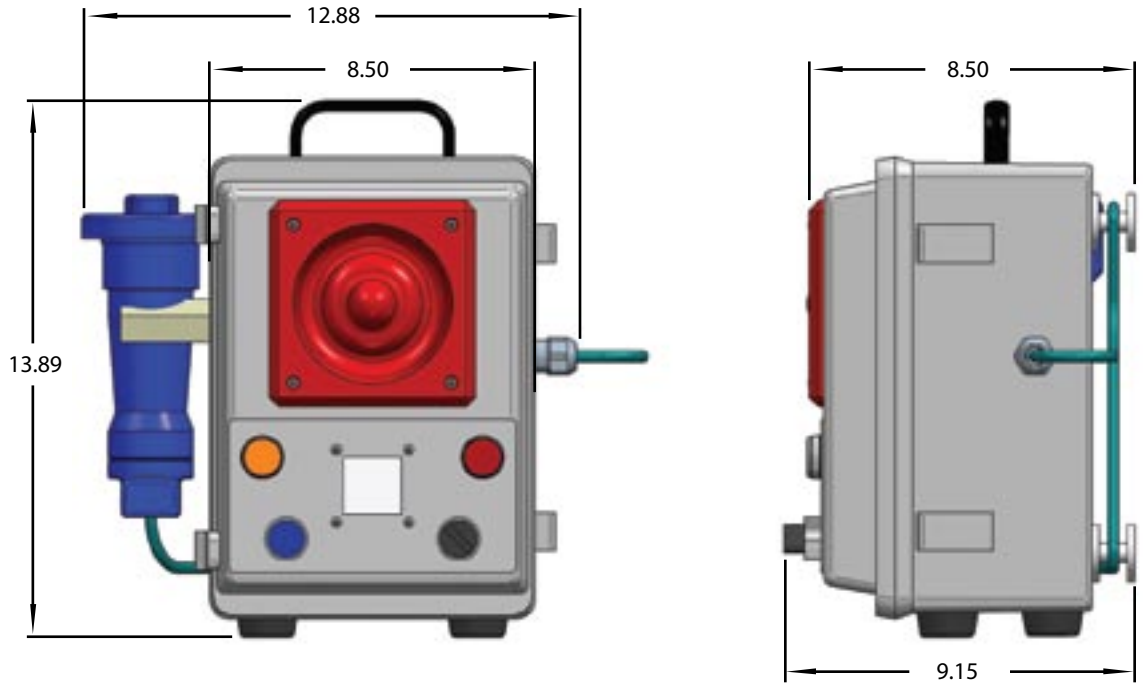
PORTABLE ALARM PANEL MODEL APM-1B LITE

- **PORTABLE AND COMPLETELY SELF CONTAINED**
  ERL's APM-1B Lite is very portable, weighing 18 lbs. The unit is battery powered with a self-contained panel and the handle makes for easy portability. A voltmeter lets you monitor battery condition when the switch is in the "ON" position.

- **SAFE RELIABLE OPERATION**
  The APM-1B Lite is housed in a weather proof enclosure rated for outdoor use. The output of the APM-1B Lite is intrinsically safe for connection in Class I, II, and III, Division 1 and 2, Groups A-G Hazardous Locations.

- **EASY TO OPERATE**
  With a long cable attached to a Hubbell 516C-1W receptacle, the APM-1B Lite allows for easy connection to the vessel liquid level sensor system with the panel positioned outside for the hazardous area. Brilliant indicator lights and a loud audible alarm warns the tankerman of a high level/overfill condition over the entire barge.

PORTABLE ALARM PANEL MODEL APM-1B



APM-1B Lite
WT = 18 lbs

FIXED ALARM PANELS
MODEL APM-2

- **FULL REGULATORY COMPLIANCE**
  ERL's APM-2 vessel mounted High Level/Overfill Alarm Annunciator Panel satisfies 46 CFR 39.20 9 (a) when connected to an ERL Liquid Level Sensor System. The installation must conform to 46 CFR 111.105 and API Recommended Practice 1125. The APM-2 Alarm Panel is U.S. Coast Guard accepted and satisfies OPA-90 requirements for overfill protection devices and is suitable for ABS classed vessels.

- **QUALITY CONSTRUCTION**
  The APM-2's weatherproof cabinet is 100% heavy gauge stainless steel. All electrical components are UL, FM and CSA approved. Each APM-2 Alarm Panel undergoes complete operational testing and final inspection before shipment.

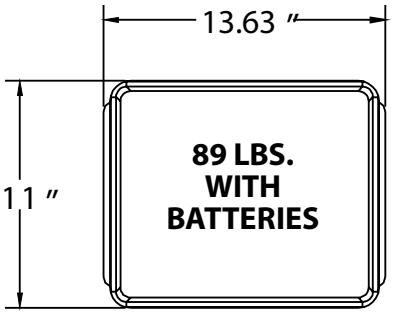
- **SAFE AND RELIABLE OPERATION**
  The annunciator lights on the APM-2 Alarm Panel are displayed in the same layout configuration as the barge's cargo compartments for quick and easy recognition. Amber lights are used to represent a high level alarm and red lights annunciate an overfill warning. Additionally, an alternating 105 decibel tone indicates a high level alarm while a steady 105 decibel tone signal indicates an overfill warning. The audible signals can be easily heard from any location on the deck.

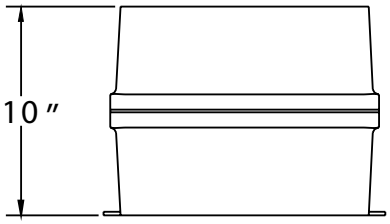
FIXED ALARM PANELS - APM-2

APM-2-3

APM-2-6

APM-2-8





BATTERY BOX

APM-2-10

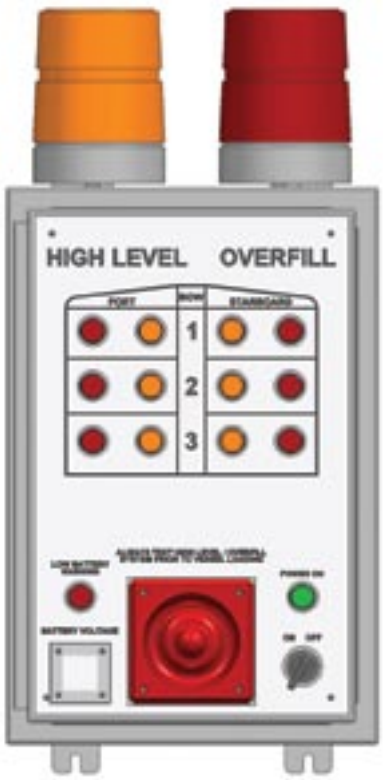
APM-2-12

FIXED ALARM PANELS - APM-2
Operation of the APM-2 Audio/Visual Annunciator

The APM-2 tank barge liquid level annunciator panel is 24 VDC battery powered. A stainless steel NEMA/ EEMAC Type 4, 24"H x 16"W x 8"D enclosure houses all electrical components and the batteries are housed in a separate battery box. Although rated for outdoor use, these enclosures are not explosion proof and therefore must be mounted outside of the hazardous area on deck per 46 CFR 111. 105-3 1. More specifically, this panel must be mounted on the open deck a minimum of 10 feet (3 meters) away from the cargo area (vapor source). When mounted over the cargo compartments, the panel must be mounted at least 8 feet over the deck per 46 CFR 111. 105-3 1, K(2).

The APM-2 panel utilizes STAHL Model 9251/02 dual channel intrinsically safe repeater relays, which are UL, FM and CSA approved for intrinsically safe connection in Class I, II and III, Division 1 and 2, Groups A - G hazardous locations. The 8.2 VDC intrinsically safe sensing circuit, of the STAHL 9251/02, safely interfaces the annunciator panel with the normally closed reed switches, which are located in a hazardous location. The UL approved independently operating reed switches are float activated to open at 95% of tank capacity representing HIGH LEVEL ALARM condition and at approximately 98% of tank capacity representing OVERFILL ALARM condition. Each cargo tank is fitted with the aforementioned sensors (switches).

Outwardly, the panel annunciator light layout reflects the cargo compartment configuration with an amber and red light pair representing HIGH LEVEL ALARM and OVERFILL ALARM respectively for each cargo compartment. Additionally, amber High Level Alarm and red Overfill Alarm 2,000,000 C.P. strobe lights sit atop the panel. The front mounted audible alarms for both High Level and Overfill have a continuously rated sound level of 105 D.B. at 1 meter. An on/ off rotary switch with power "on" light, battery condition voltmeter and red low power warning light are also located on the front of the panel.



APM-2-6

PHYSICAL DIMENSIONS

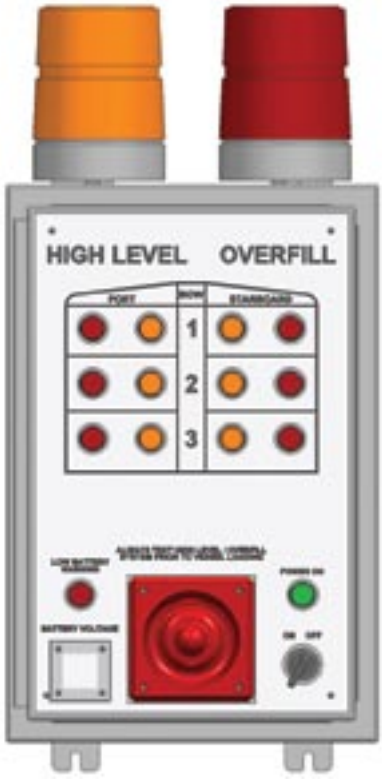
Panel	Weight	Size H - W - D
APM-2 - 3	51 lbs.	34" x 16"' x 8"
APM-2 - 6	58 lbs.	34" x 16" x 8"
APM-2 - 8	62 lbs.	34" x 16" x 8"
APM-2 - 10	66 lbs.	34" x 16" x 8"
APM-2 - 12	76 lbs.	40" x 20" x 8"

FIXED ALARM PANELS - APM-2
Operation of the APM-2 Audio/Visual Annunciator (Continued)

Panel operation is as follows.

When liquid level reaches 95% capacity in a cargo compartment, the high level sensor reed switch protecting that compartment opens, breaking the intrinsically safe sensing loop from its corresponding 9251/02 repeater relay. This relay turns on the amber High Level Alarm light showing which specific compartment has the 95% full condition. Simultaneously, the top mounted yellow strobe light begins to flash and the high level audible signal sounds. After an adjustable time period of approximately 5 seconds, the amber strobe light and high level audible signal will shut off, yet the amber individual compartment High Level indicator light will remain lit. When the first high level condition is achieved, the High Level series loop of dry panel contacts feeding pins L3 and N of the Hubbell 516B-IW Barge to Shore Receptacles open. If the barge is connected to a dock facility, which can accept this signal, the dock will immediately be aware of the High Level condition. In turn, each subsequent high level condition will be annunciated as describe above.

In the event liquid level reaches 98% capacity, simultaneously the individual compartment red overfill light will light, the red strobe light will light, the overfill audible alarm will sound and the barge to shore connection circuit indicating overfill alarm will open at pins L1 and L2, alerting the dock facility of the overfill condition if the facility has provisions to accept this signal. All of these system conditions remain until liquid level is reduced or the annunciator panel power switch is turned off. With panel power switched “off” or if the battery power fails, both High Level and Overfill conditions will be indicated at the barge to shore connection receptacles. If the annunciator panel power switch is “on” and battery power drops too low, to a value of approximately 20 VDC, the red low power warning light will come on and the barge to shore connection will indicate both High Level and Overfill conditions.



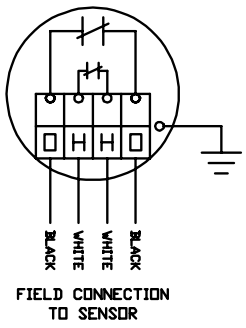
APM-2-6

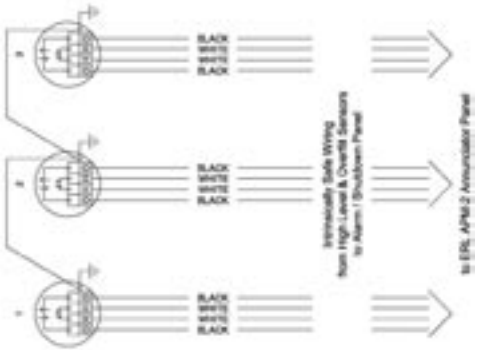
During pre-transfer overfill system testing as required in 46 CFR 39.20(b)3, all system components are fully tested. During this system test, battery supply voltage is clearly 0-21 indicated and if supply voltage is less than 21 VDC, the two series connected 12 VDC gel cell batteries must be recharged or replaced with fully charged batteries. Approximately 50 hours of panel operation can be expected from a fully charged battery set. As an option, solar modules can be provided to recharge the batteries on the barge making the power supply maintenance free.

FIXED ALARM PANELS
TYPICAL APM-2 WIRING DIAGRAMS

The high level/overfill sensors are located in a Class 1, Division 1, Group D hazardous location. The normally closed contacts are connected to Stahl series 9251/02 intrinsically safe repeater relays which limit voltage ot 8.2 VDC. This is an intrinsically safe circuit.

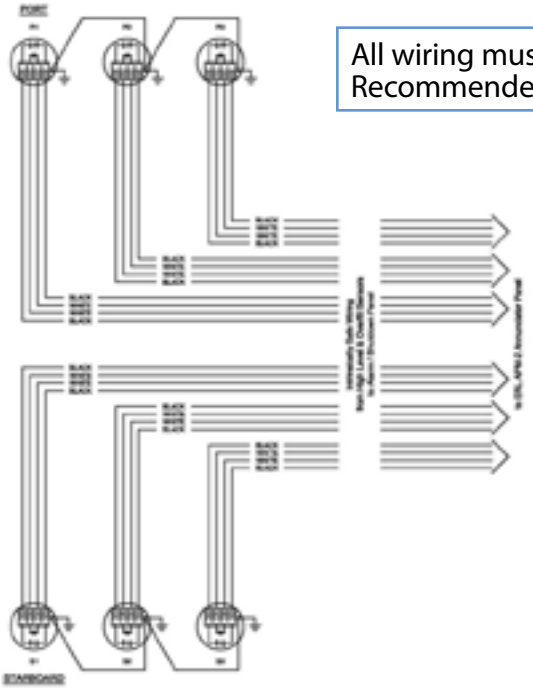
Reed Switch UL Approval No. E122752 (N) SPST Form A
Capacitance 0.2 Picofarads - Inductance 0

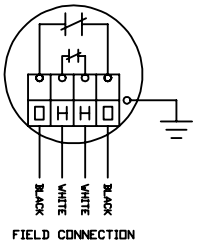


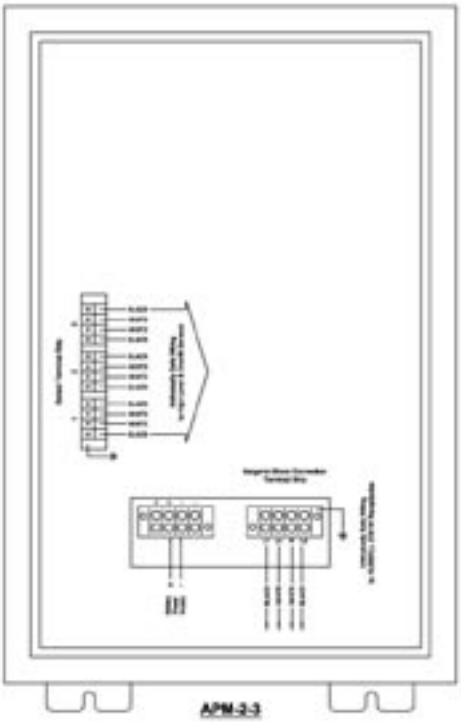


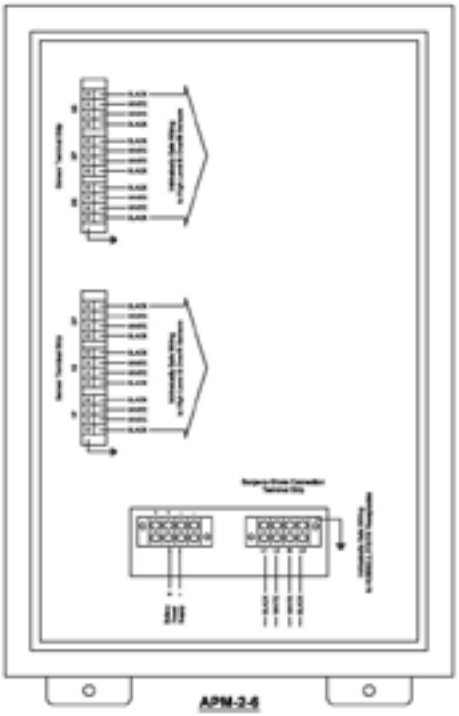
4-conducter 16 gauge bronze armored foil shield with 20 gauge ground wire TPS1 6T1 B-2 or equal.

All wiring must conform to API Recommended Practice 1125









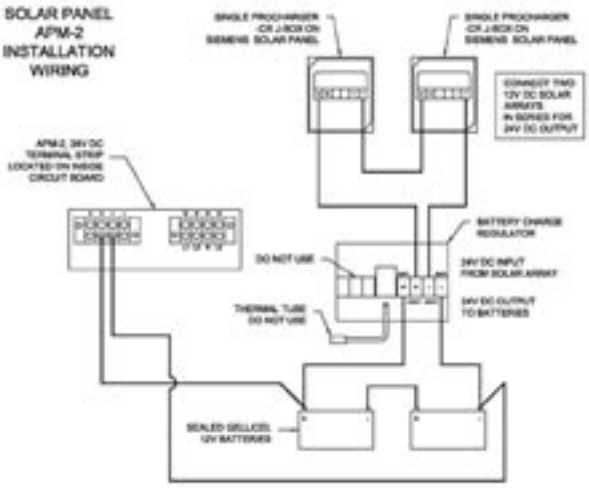
FIXED ALARM PANELS
TYPICAL APM-2 WIRING DIAGRAMS

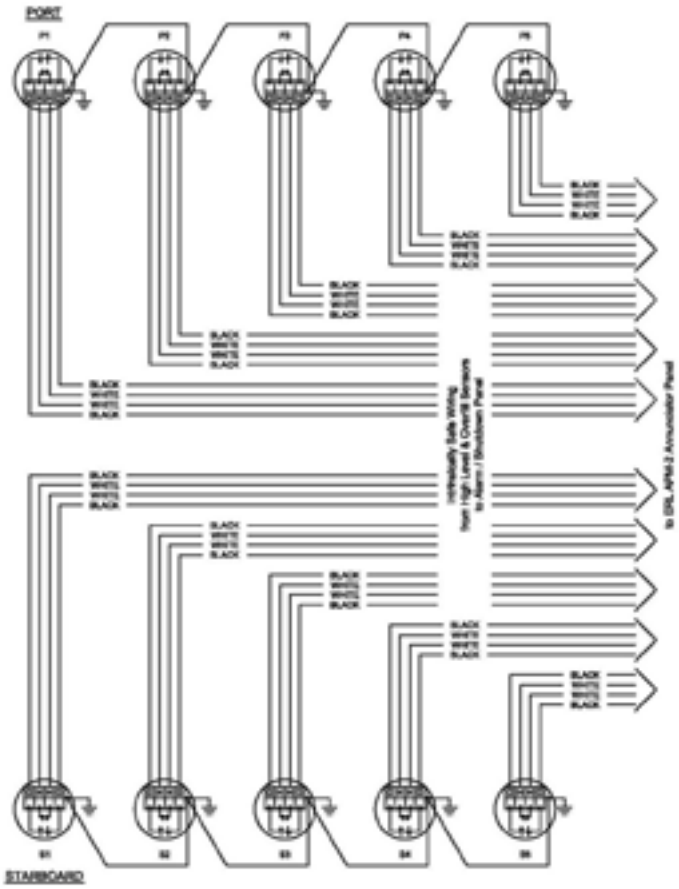
The high level/overfill sensors are located in a Class 1, Division 1, Group D hazardous location. The normally closed contacts are connected to Stahl series 9251/02 intrinsically safe repeater relays which limit voltage ot 8.2 VDC. This is an intrinsically safe circuit.

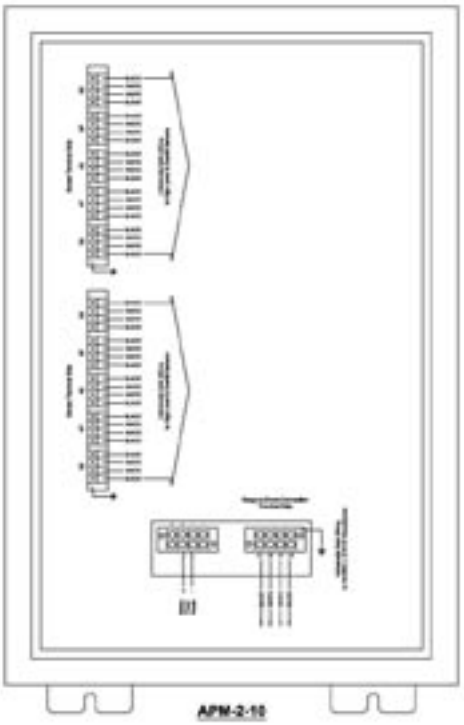
Reed Switch UL Approval No. E122752 (N) SPST Form A Capacitance 0.2 Picofarads - Inductance 0

4-conducter 16 gauge bronze armored foil shield with 20 gauge ground wire TPS1 6T1 B-2 or equal.

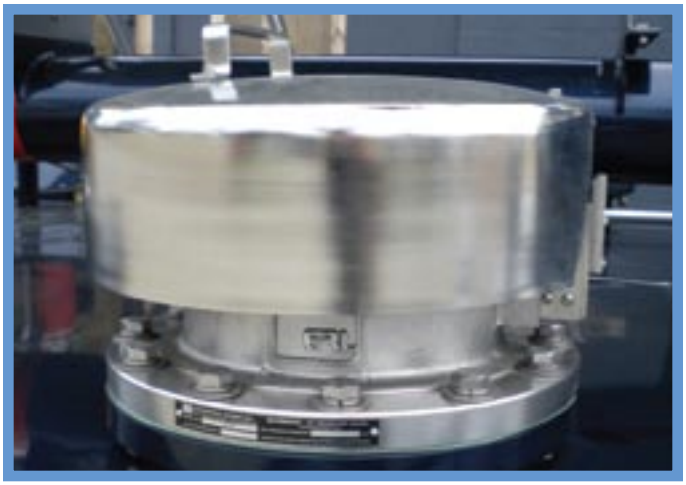
All wiring must conform to API Recommended Practice 1125







SUPERAC™ 12" ROUND MARINE SAFETY RELIEF VALVE



U.S. Patents 5,205,311 & 5,158,104

- **AUTOMATIC OPERATION**
  The Superac 12" round Marine Safety Relief Valve (Spill Valve) is designed to operate automatically with a set point repeatability of 3%. This valve was designed and built to withstand the most severe marine service and cargos. Should an overfill or over pressurization occur, this valve will automatically open sufficiently to relieve cargo at a flow rate equal to the overfill rate. This will maintain safe working pressure within the cargo compartment being protected. When the overfill condition abates, the valve will automatically close and reseal. In addition to overfill protection, this valve also protects the cargo compartment from over pressurization which can occur if the vent header piping becomes blocked or if a P-V Valve does not open.

- **SIMPLE WEIGHT OPERATED DESIGN**
  Our exclusive weight operated design with non linear closure force affords increased flow rates at reduced pressure drops. This valve has very few parts and virtually no maintenance requirements except for the resilient vapor seal.

- **EASILY FIELD TESTED**
  Checking the valve prior to each loading could not be easier. Simply lift the Test Handle to verify that the valve is working and/or is not stuck. ERL's exclusive set point test feature also allows you to verify set opening point at the valve on deck in less than one minute.

- **VAPOR TIGHT SEAL**
  ERL's resilient seal and Teflon™ seal shield are field proven to seal very well and provide extended service life.

- **100% STAINLESS STEEL CONSTRUCTION**
  All components are 300 series stainless steel except for the elastomer seal and the seal shield for extended service life with little need for maintenance.

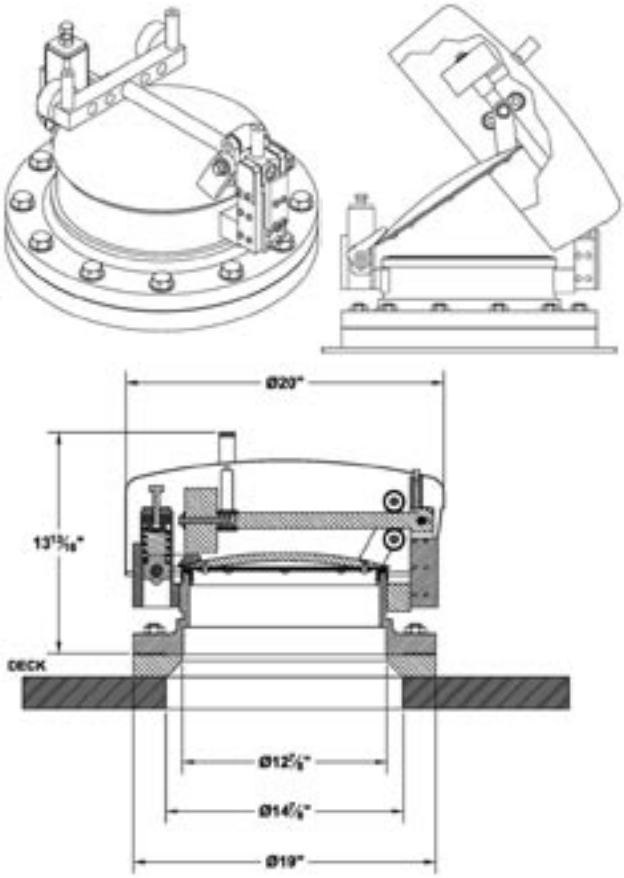
- **CERTIFIED TO MEET OR EXCEED ALL USCG REQUIREMENTS**
  Every Superac Safety Relief Valve is 100% factory tested prior to shipment. The Superac 12" Round Marine Safety Relief Valve is certified to meet or exceed all USCG and ASTM F-1271 test requirements.

SUPERAC™ 12" ROUND MARINE SAFETY RELIEF VALVE

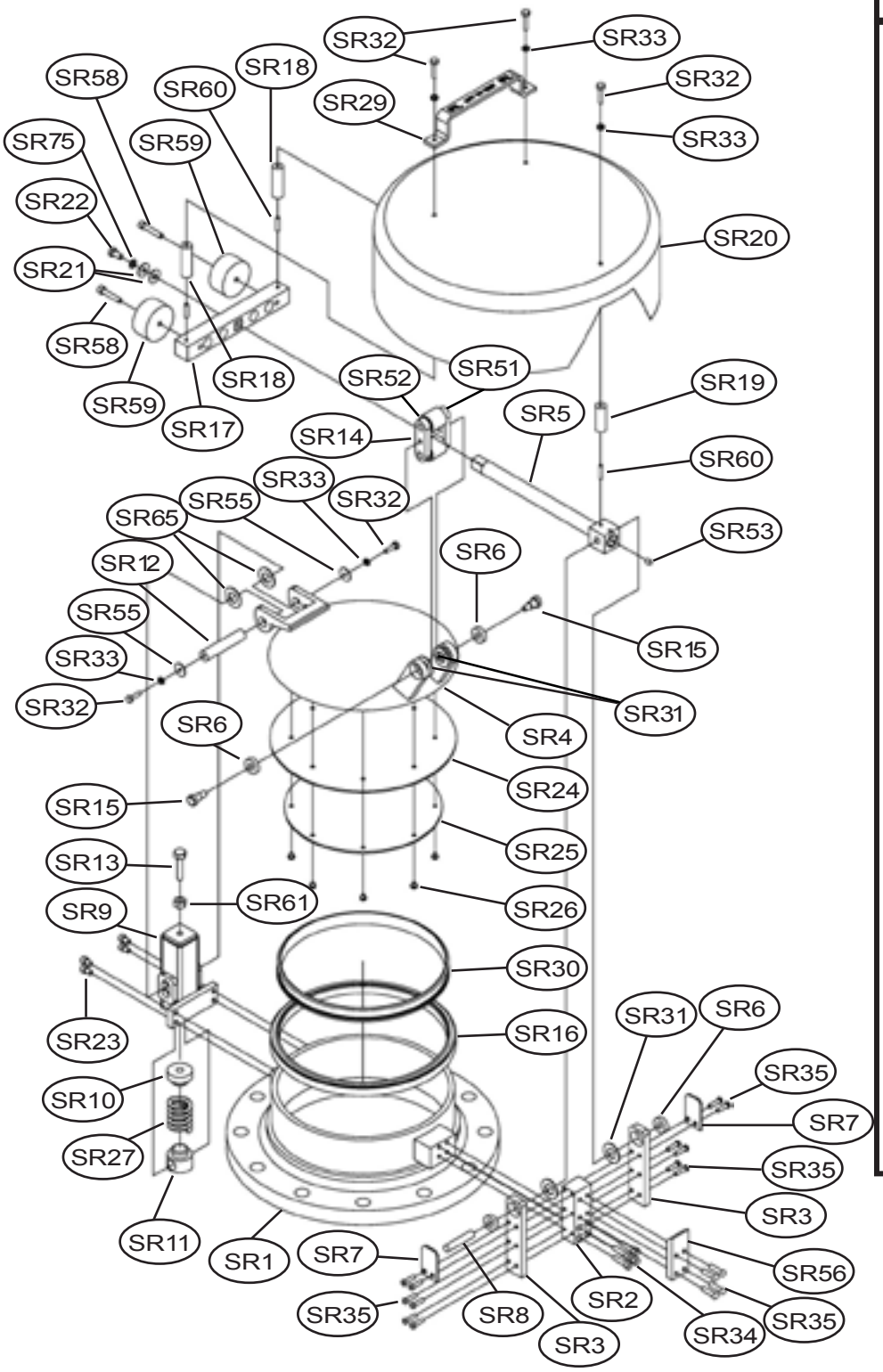
VALVE SHOWN WITH WEATHER COVER INSTALLED

VALVE OPEN WITH WEATHER COVER INSTALLED

PORTABLE SET POINT CHECKING DEVICE INSTALLED

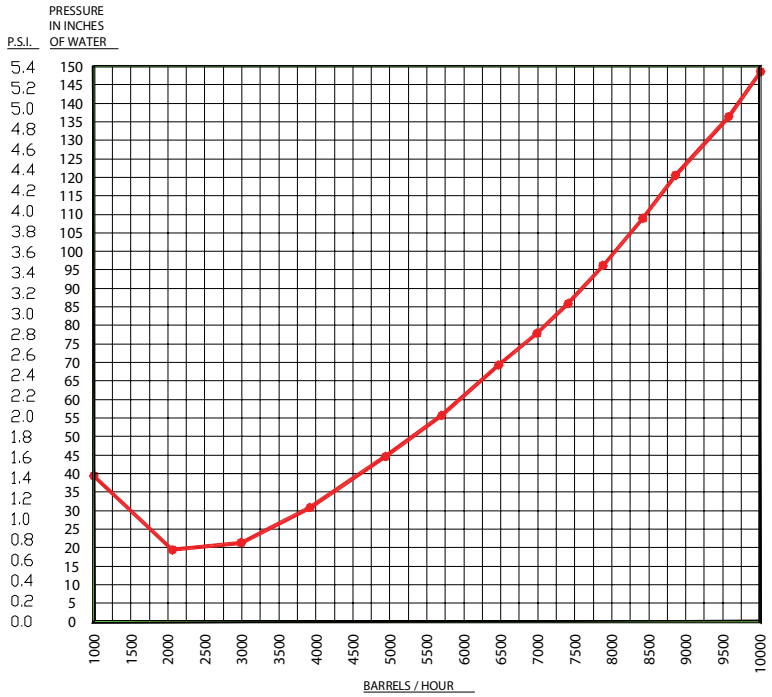


SUPERAC™ 12" ROUND SAFETY RELIEF VALVE III ASSEMBLY DRAWING



ITEM #	DESCRIPTION	QTY.
SR1	Flange Weldment	1
SR2	Arm Hinge Spacer	1
SR3	Arm Hinge Side	2
SR4	Lid Weldment	1
SR5	Pivot Rod Weldment	1
SR6	Bearing	12
SR7	Bearing Retainer	2
SR8	Arm Hinge Shaft	1
SR9	Spring Housing Weldment	1
SR10	Spring Retainer	1
SR11	Pivot Retainer	1
SR12	Spring Shaft	1
SR13	Hex Head Bolt 1/2 x 2-1/2	1
SR14	Roller Assembly	1
SR15	Shoulder Bolt 1/2 x 1/2	2
SR16	Pipe Seal	1
SR17	Set Weight Mount	1
SR18	Standoff - Tall	2
SR19	Standoff - Short	1
SR20	Cover	1
SR21	Fender Washer 3/8 ID	2
SR22	BHCS 3/8-16 x 3/4	1
SR23	SHCS 5/16-24 x 5/8	4
SR24	Seal Plate Gasket	1
SR25	Gasket Retainer	1
SR26	BHCS 1/4-20 x 1/2	8
SR27	Spring	1
SR29	Test Handle	1
SR30	Seal Shield	1
SR31	Housing Side Gasket	4
SR32	Hex Bolt 1/4-20 x 3/4	5
SR33	1/4 Lockwasher	5
SR34	SHCS 5/16-18 x 2	4
SR35	BHCS 1/4-20 x 1	16
SR51	Roller Mount	2
SR52	1/4-20 X 1/4 S.S.S	2
SR53	Roller Sleeve	5
SR54	Roller Shaft	2
SR55	Fender Washer 1/4 ID	2
SR56	Indicator Test Plate	1
SR58	Hex Head Bolt 3/8-16 x 1 to 2-3/4	2
SR59	Set Weight 1 lb. - 3 lb.	2
SR60	SET SCREW 1/4-20 X 1"	3
SR61	HEX NUT 1/2"	1
SR65	Hinge Side Gasket	2
SR75	3/8 Lockwasher	1

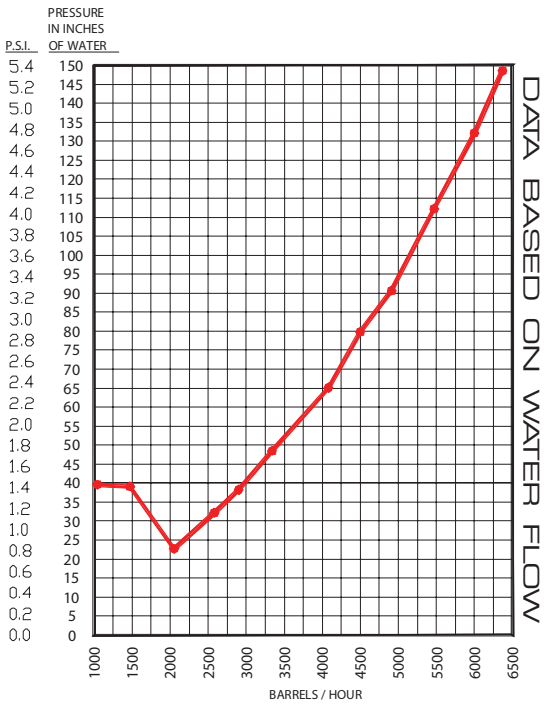
SUPERAC™ 12" ROUND MARINE SAFETY RELIEF VALVE FLOW CURVE - 1.2 PSI SET POINT WEIGHTS



BARRELS PER HOUR	PRESSURE INCHES OF H^2O	P.S.I
1000	39.35	1.42
2060	19.39	0.70
2990	21.34	0.77
3920	30.76	1.11
4940	44.57	1.59
5700	55.69	2.01
6470	69.27	2.50
6990	77.86	2.81
7410	85.90	3.10
7880	96.15	3.47
8420	108.89	3.93
8860	120.53	4.35
9580	136.33	4.92
10010	148.52	5.36

Engineering Research Center
Colorado State University

SUPERAC™ 12" ROUND MARINE SAFETY RELIEF VALVE FLOW CURVE - 1.2 PSI SET POINT WEIGHT W/ 10" ADAPTER



BARRELS PER HOUR	PRESSURE INCHES OF H^2O	P.S.I
1040	39.62	1.43
1470	39.07	1.41
2050	22.72	0.82
2580	32.14	1.16
2900	38.24	1.38
3340	48.49	1.75
4080	65.12	2.35
4500	79.80	2.88
4910	90.61	3.27
5470	112.22	4.05
6000	132.17	4.77
6370	148.52	5.36

Engineering Research Center
Colorado State University

DESCRIPTION OF THE ERL SUPERAC™ 12" ROUND SAFETY RELIEF VALVE III

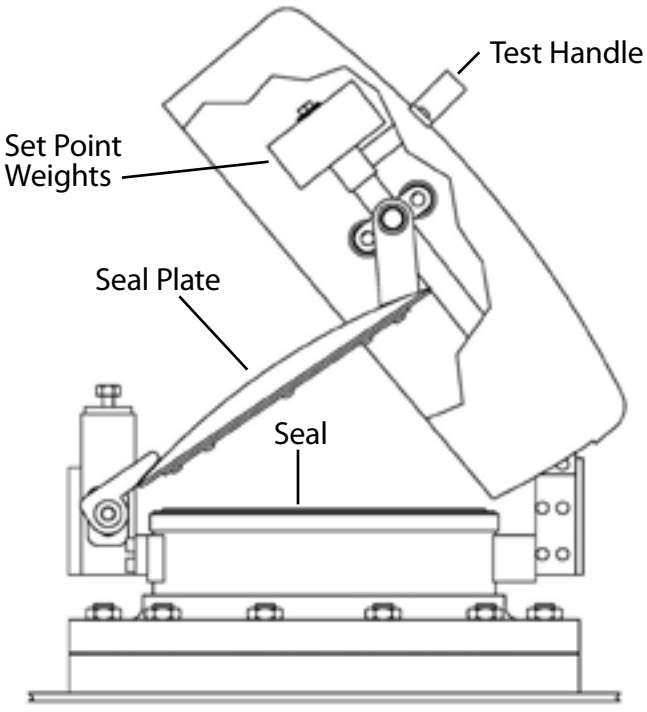
- The Superac™ 12" Round Safety Relief Valve III (Spill Valve) is designed to operate automatically with a set point repeatability of 3%. This valve was designed and built to withstand the most severe marine service and cargos. Should an overfill or over pressurization occur, this valve will automatically open sufficiently to relieve cargo at a flow rate equal to the overfill rate. This will maintain safe working pressure within the cargo compartment being protected. When the overfill condition abates, the valve will automatically close and reseal. In addition to overfill protection, this valve also protects the cargo compartment from over pressurization which can occur if the vent header piping becomes blocked or if a P-V Valve does not open.

- The seal plate is comprised of a Teflon™ faced stainless steel seal plate closing against a resilient seal and Teflon™ seal shield. The low friction weight operated mechanism utilizes set point weights, sealed stainless steel roller bearings and a pivoting arm rather than a vertically sliding shaft to reduce friction and improve set point accuracy. *(fig. 1)*

- Our exclusive weight operated design with non linear closure force affords increased flow rates at reduced pressure drops. This valve has very few parts and virtually no maintenance requirements except for the resilient seal.

- ERL offers an optional adapter mounting ring which allows the 12" valve to bolt to a existing 10" flange.

- Field testing prior to each loading is easily done by lifting the test handle (fig. 1) to verify that the valve is working and/or is not stuck. An optional test rod and weight also allow the operator to verify set opening point at the valve on the deck.



WARNING
The safety relief valve can expel cargo vapors. Many cargo vapors are hazardous. Exposure to these vapors can be detrimental to your health. Only properly trained personnel with the appropriate safety equipment should be on board the vessel to perform the required manual testing of the valve prior to each loading.

ERL SUPERAC™ 12" ROUND SAFETY RELIEF VALVE III INSTALLATION

1. After receiving the Superac™ 12" Round Safety Relief Valve III inspect each valve for shipping damage. If damage is found, file a claim immediately with the carrier and also notify E.R.L. Inc.

2. Check the I.D. tag on the side of the valve to determine that the set point is within the specifications of the barge before installing. (fig. 2) This setting must be at least 10% higher than the P-V valve pressure setting.

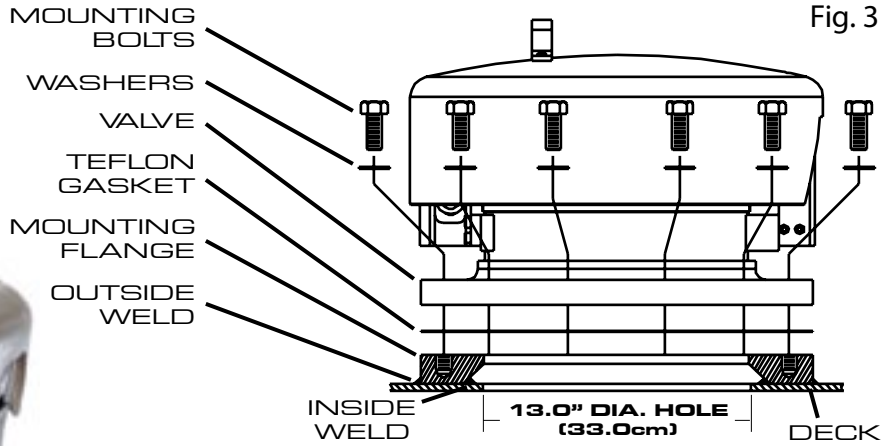
3. The Safety Relief Valve comes with a mounting flange that is to be welded to the deck. A 13.0" diameter hole should be cut into the deck where the valve is to be positioned. Center the mounting flange over the hole. Tack weld 8 places around the outside diameter of the flange. This is important in order to prevent warping of the flange during the welding process. After the tack welds are in place, the inside diameter should be welded with a continous 1/4" weld. Once the inside diameter weld is finished then a continous 1/4" weld needs to be placed around the outside diameter. (fig. 3) The installer must protect the top of the flange from weld spatter due to the fact that it is a machined sealing surface.

4. Apply a thin coat of Rector Seal Tplus 2 to both sides of the 1/16" thick teflon gasket. Place the gasket onto the mounting flange then install the valve onto the gasket and mounting flange with the 3/4-10 x 2-1/4" hex head bolts and washers. Apply Never Sease to the bolt threads prior to assembly.

5. Upon installation, manually test the valve to insure the valve operates freely. (see page 3) Also, perform barge pressure testing as required by the vessel owner.

Fig. 2

Fig. 3



CAUTION! DO NOT:
Paint the Safety Relief valve. Drop the valve, slide it or handle in a rough manner.
Weld on or modify the valve in any way.

ERL SUPERAC™ 12" ROUND SAFETY RELIEF VALVE III TESTING

- Per U.S. Coast Guard regulations the E.R.L. Superac™ 12" Round Safety Relief Valve III has a mechanical means to verify that it opens freely. This test can be performed with the weather cover in place. Simply lift up on the test handle. (fig. 4)
- On-barge testing or bench testing of valve functions can be performed by personnel trained to perform such test. In case of on barge testing extreme caution should be used to avoid overpressurizing the barge.
- The manual test must be performed prior to each vessel loading.

Fig. 4

WARNING
The safety relief valve can expel cargo vapors. Many cargo vapors are hazardous. Exposure to these vapors can be detrimental to your health. Only properly trained personnel with the appropriate safety equipment should be on board the vessel to perform the required manual testing of the valve prior to each loading.

ERL SUPERAC™ 12" ROUND SAFETY RELIEF VALVE III TESTING

- The Set Point Test confirms that the valve is free to function and verifies that the valve opens at it's designed set point. It is done with the optional test rod and test weight. (fig. 5) Test weights are matched to the set point of the valve, 1 through 3 psi.

Fig. 5

ERL SUPERAC™ 12" ROUND SAFETY RELIEF VALVE III TESTING

- Before installing the test rod, thoroughly clean the test rod and the hole in the test weight with a product such as WD-40.
- Install the test rod onto the pivot arm by positioning the dowel pin (fig. 6) that extends out of the bottom of the block at the end of the test rod into the hole on the pivot arm which is located just inside the opening in the weather cover. (fig. 7)

Fig. 6

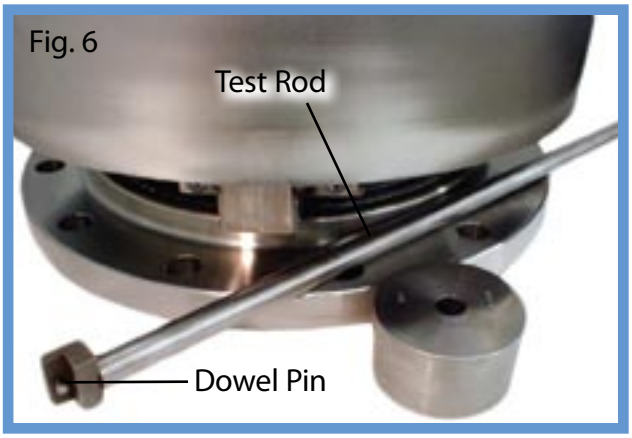


Fig. 7

- With the test rod in place, slide the appropriate test weight onto the test rod and position it against the weather cover. (fig. 8)
- Next, slowly slide the test weight away from the valve being very careful not to exert any downward force on the test rod or test weight. (fig. 9)
- The valve must reach the "opening condition" while the outer most end of the weight is in the flat trip zone section on the test rod. (see page 5 for description of the trip zone) The "opening condition" occurs when the bottom of the test rod first touches the top of the test indicator plate. (fig 10)

Fig. 8

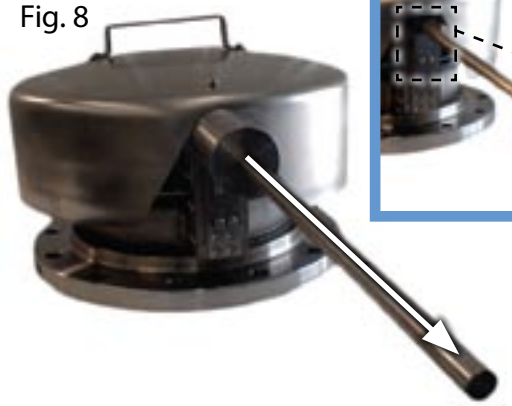


Fig. 9

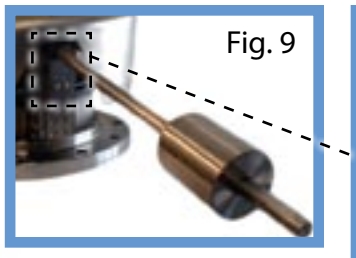
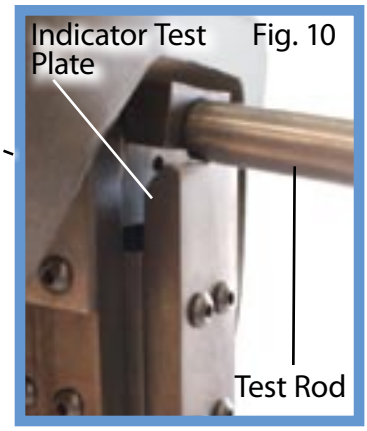


Fig. 10

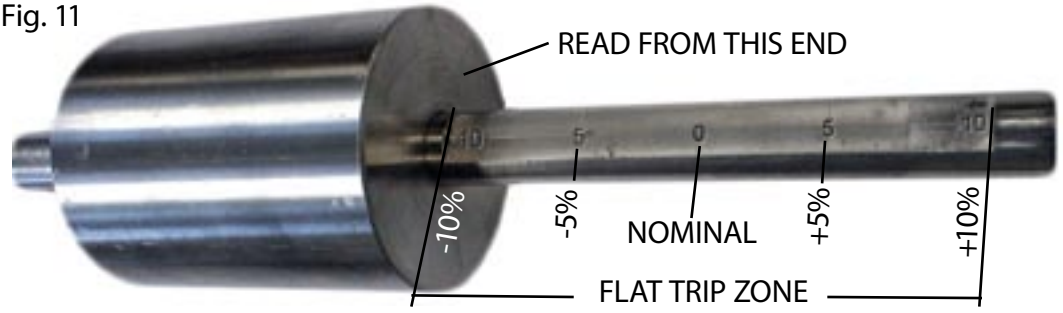


ERL SUPERAC™ 12" ROUND SAFETY RELIEF VALVE III SET POINT TEST

- If the valve reaches the "opening condition" when the test weight is at the "10" mark nearest the valve body, then the valve is tripping at a low pressure by 10% (fig.11). Conversely, if the valve trips (test rod touching the top of the indicator test plate) and the test weight is at the "10" mark nearest the end of the test rod, then the valve is tripping 10% above the set point. If the valve reaches the opening condition prior to reaching the trip zone, try the procedure again and make sure that you are not inadvertantly exerting any downward force on the test rod or test weight. You may try lifting the weight slightly as you slide it along the test rod and lightly release it at intervals along the way. A trip point +/- 10% anywhere in the flat trip zone is acceptable.

- If the valve trips before you reach the trip zone, the pressure is too low. If the valve trips beyond the trip zone then the set point is too high. Either event is unlikely with this valve since the entire trip mechanism is gravity operated. Do not hesitate to call ERL for assistance if the trouble shooting guide, shown below, fails to achieve the proper set point opening response.

Fig. 11



TROUBLESHOOTING GUIDE		
	POSSIBLE CAUSE	REMEDY
TRIPS TOO LOW	Improper Test Weight	Check to see that the test weight has the same set point pressure stamped on it that the valve is set for.
	Improper Set Weights	Check to see that the set weight has the same set point pressure stamped on it that the valve is set for.
TRIPS TOO HIGH	Improper Test Weight	Check to see that the test weight has the same set point pressure stamped on it that the valve is set for.
	Improper Set Weights	Check to see that the set weight has the same set point pressure stamped on it that the valve is set for.
	Contamination or product buildup	Remove the seal and seal shield and thoroughly clean.
	Mechanical damage	Call E.R.L. for replacement parts. 812.948.8484

SECTION 03

VENTING PRODUCTS

Superac 6" stainless steel High Velocity PV valve Model II - mounted on collapsible piping.

Superac 6" High Velocity PV valve Model II - Mounted on collapsible piping next to Emergency Shutdown (EMS-001) sign with stainless steel frame (EMF-001).

2.5" Equate PV Valve mounted on stand pipe next to 2" Sampling Ball Valve.

Typical Vapor Headers with ERL Vent Header Sight Glass and ERL Model 505 Pressure/Vacuum Gauge.

8" Equate PV Valve mounted on Vapor head pipe.

Model 505 stainless steel Pressure/Vacuum Gauge mounted on Vapor Header.

EXCERPTS FROM FEDERAL REGISTER

PART 11 - Dept. of Transportation - Coast Guard - June 21,1990
46CFR Part 39 Vapor Control Systems
Subpart 39.20 Design and Equipment
39.20-11 Vapor overpressure and vacuum protection -TB/ALL (continued)

The following section, reprinted here for your convenience, contains the USCG rules and regulations pressure/vacuum venting systems.

VENTING PROTECTION

39.20-11 Vapor overpressure and vacuum protection- TB/All

(a) The cargo tank venting system required by 32.55 of this chapter must:

(1) Be capable of discharging cargo vapor at 1.25 times the maximum transfer rate such that the pressure in the vapor space of each tank connected to the vapor collection system does not exceed:

(i) The maximum design working pressure for the tank, or (ii) If a spill valve or rupture disk is fitted, the pressure at which the device operates;

(2) Not relieve at a pressure corresponding to a pressure in the cargo tank vapor space of less than 1.0 psig;

(3) Prevent a vacuum in the cargo tank vapor space, whether generated by withdrawal of cargo or vapor at maximum rates, that exceeds the maximum design vacuum for any tank connected to the vapor collection system; and

(4) Not relieve at a vacuum corresponding to a vacuum in the cargo tank vapor space of less than 0.5 psi below atmospheric pressure.

(b) Each pressure-vacuum relief valve must:

(1) Be tested for venting capacity in accordance with paragraph 1.5.1.3 of API 2000; and

(2) Have a means to check that the device operates freely and does not remain in the open position, if installed after July 23, 1991.

(c) The relieving capacity test required by paragraph (b)(1) of this section must be carried out with a flame screen fitted at the vacuum relief opening and at the discharge opening if the pressure-vacuum relief valve is not designed to ensure a minimum vapor discharge velocity of 30 meters (98.4 ft.) per second.

HIGH VELOCITY PRESSURE/VACUUM RELIEF VALVE AUTOMATIC OPERATION

SUPERAC™ MODEL PV-6 II

U.S. COAST GUARD APPROVED

U.S. Patent 5,960,823

- **QUIET, AUTOMATIC OPERATION**
  The PV-6 II valve has all of the proven design characteristics that have made the original PV-6 valve so reliable. In addition to quiet automatic operation, the vacuum side of the PV-6 II valve has 30% fewer parts, increase flow rate and a 16% angled housing to allow positive drainage of any cargo condensation.

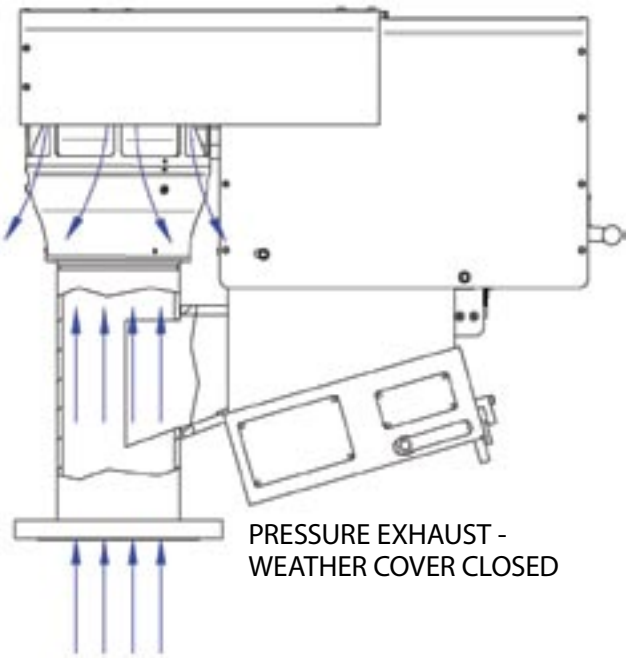
- **SIMPLE WEIGHT OPERATED DESIGN**
  Our weight operated design doesn't suffer from the performance variations caused by spring deterioration or the increased friction between internal guide stems and bushings common with friction-type designs. All operating mechanisms are located outside of the vapor stream eliminates the possibility of valve sticking due to product or contaminant build-up. Also the vacuum side of the valve is angled for positive drainage of cargo condensation back into the vapor header.

- **SET POINT REPEATABILITY 3%**
  Unique low friction design utilizes sealed stainless steel roller bearings outside of the vapor exhaust stream allowing the valve to open repeatedly within 3% of factory stated set opening point. Two easily reached test handles, as required by law, allow for easy testing.

- **100% STAINLESS STEEL**
  The main valve body is made of 1/2" thick stainless steel, with 1/4" pipe. Even the bearings and the full weather covers are stainless steel.

- **HIGH VELOCITY DISCHARGE**
  The minimum discharge velocity rate of 40 meters/second is achieved at even the lowest flow rates. The unique pressure focusing nozzle creates a columnar exhaust flow path allowing vapors to disburse well above the deck level.

DESCRIPTION OF THE PV-6 II

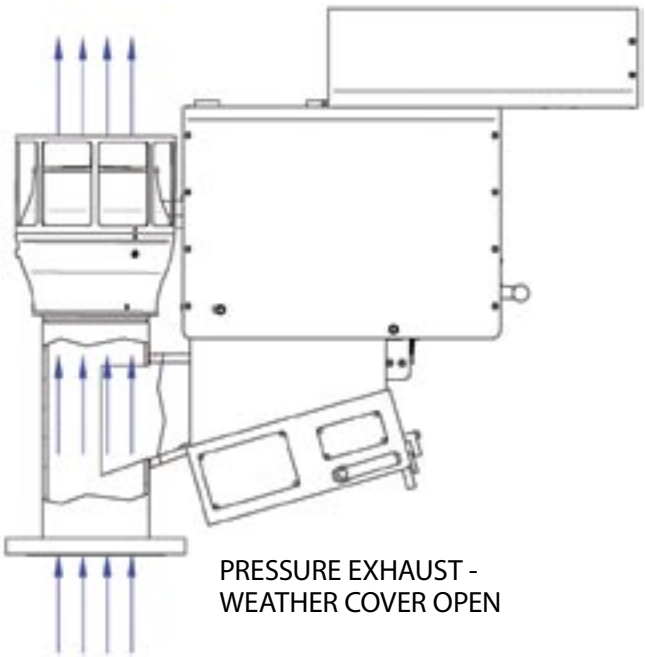


PRESSURE EXHAUST - WEATHER COVER CLOSED

The ERL Superac 6" High Velocity weight operated P-V Valves operates automatically on both the High Velocity pressure side and the vacuum side of each valve. All of the operating mechanisms are located outside of the vapor exhaust stream. This is critically important since it eliminates valve sticking due to contaminant build up between shafts and bushings. The Superac design uses sealed stainless steel bearings at all pivot points, which greatly improves valve set point accuracy. This design creates a valve, which is repeatable to 3% of set opening point and has a total pressure increase of less than 10% from initial opening to the full open flow rate exceeding 18,000 barrels per hour on the pressure side. The weather cover can be either closed or open during operation. With this cover closed, the pressure side of the valve exhausts through a radial 30 x 30 mesh stainless steel flame screen. The portion of the cover over the vertical discharge section of the valve is hinged so that it may be opened to allow the high velocity flow to travel straight up in order to effectively get the vapors out of the deck working environment.
The focusing nozzle that directs this flow upward is similar in construction to a high velocity hose nozzle in that it incorporates both an inner cone and an outer focusing shell. This construction results in superior performance.

The outer shell and weather cover prevent the possibility of snow and ice buildup at the discharge nozzle.

The pressure sides of both valves achieve a minimum discharge velocity of 40 meters per second even at the lowest flow rates. This number is obtained due to the fine finish of the inner cone, smooth air flow path provided in the nozzle orifice and the accurately controlled weight operated opening mechanism. A damper is provided to prevent valve oscillations or chatter on both the pressure and vacuum sides of both P-V Valves.



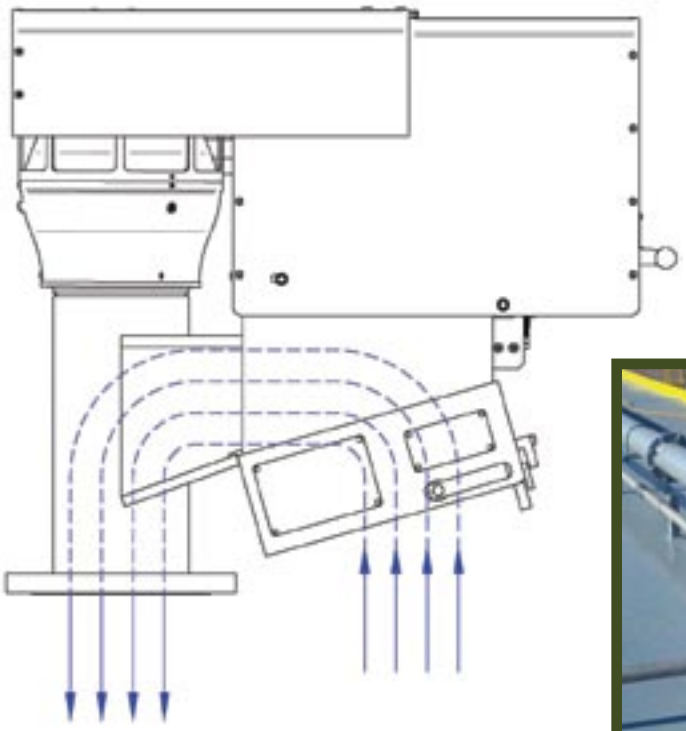
PRESSURE EXHAUST - WEATHER COVER OPEN

DESCRIPTION OF THE PV-6 II

The vacuum sides of both valves use a Teflon-faced stainless steel seal plate closing against a machined stainless steel opening. This weight operated mechanism uses a pivoting arm rather than a vertically sliding shaft to reduce friction and improve set point accuracy. This design approach yields repeatability of 3% of set point opening pressure. A drawer style flame screen of 30 x 30 mesh is fitted to the vacuum inlet allowing rapid cleaning and service.

Valve operation is fully automatic and totally weight operated preventing changes in performance over time due to spring deterioration or increased friction within the valve.

Although the operating principal for the vacuum side of each valve is similar, the PV-6 II has 30% fewer parts, an increased vacuum flow rate and a 16% angled housing to insure positive drainage of any cargo condensation.



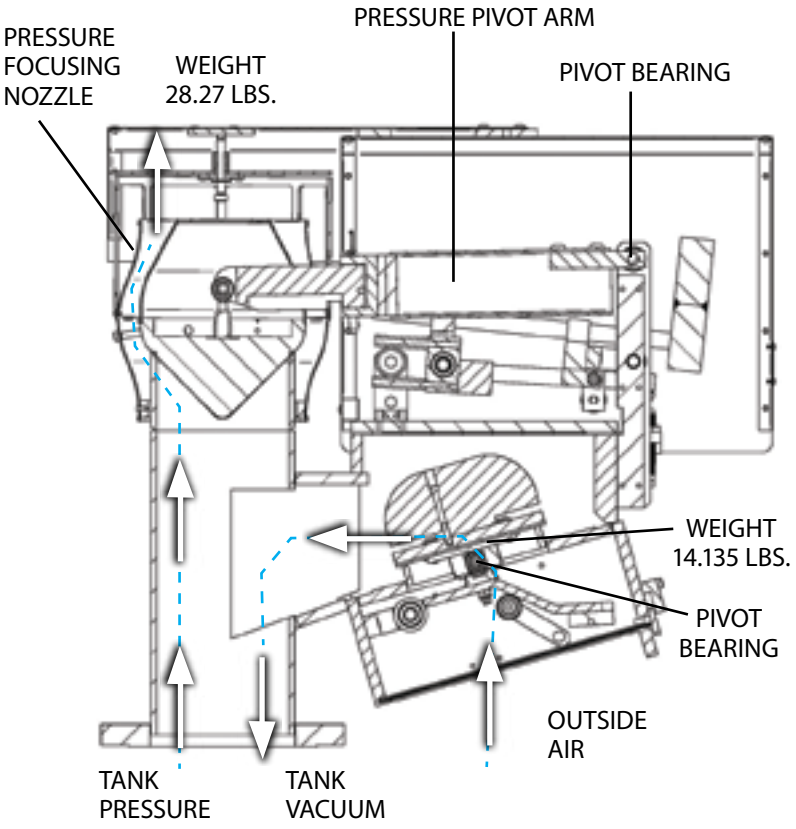
Both the pressure and vacuum sides of the valve are equipped with test handles which allow the operator to easily open the valve for testing.

Superac 6" stainless steel High Velocity PV valve Model II shown on 8" vent header.

OPERATION OF THE ERL PV-6 II OPERATING PRINCIPLE

The term, P-V VALVE is short for Pressure and Vacuum Relief Valve. As the name implies, the P-V Valve is a dual function valve. Mounted on a liquid cargo vessel, this valve opens at a specific design set point to relieve vessel tank pressure to the atmosphere. Also, in the event the liquid cargo vessel experiences a negative pressure, or vacuum, the vacuum side of the valve opens at a specific design set point permitting outside air to enter the vessel. Simply stated, the P-V Valve allows a liquid cargo vessel to breath in and out within specific design vacuum and pressure levels.

The Superac™ P-V Valve Model I and Model II are both weight operated on both the pressure and vacuum sides of the valve. This means that on both sides of the valve there is a round opening, each sealed by a weight. The area of each opening in square inches is calculated as Pi x r^2 or 3.141 x 3^2. The area and the sealing weight over this area directly relate to the pressure at which the valve opens. The formula for calculating set opening point of a weight operated valve is:



$$\text{SET POINT} = \frac{\text{WEIGHT}}{3.141 \times \text{RADIUS SQUARED}}$$

For example:

$$\text{1 PSI SET POINT} = \frac{28.27 \text{ lbs.}}{3.141 \times 3 \text{ SQUARED}}$$

This formula is the same for all weight operated valve designs and works on both the pressure and vacuum side of the valve. The illustration to the left will help illustrate the principle of our weight operated valve.

PV Valves are mechanical devices and they operate in a vaporous environment, often laden with rust particles. Friction within the PV Valve is a concern, because set opening points can increase directly as friction increases. Therefore the adjusted set point formula below includes friction to more closely reflect actual conditions.

$$\text{SET POINT} = \frac{\text{WEIGHT + FRICTION}}{3.141 \times \text{RADIUS SQUARED}}$$

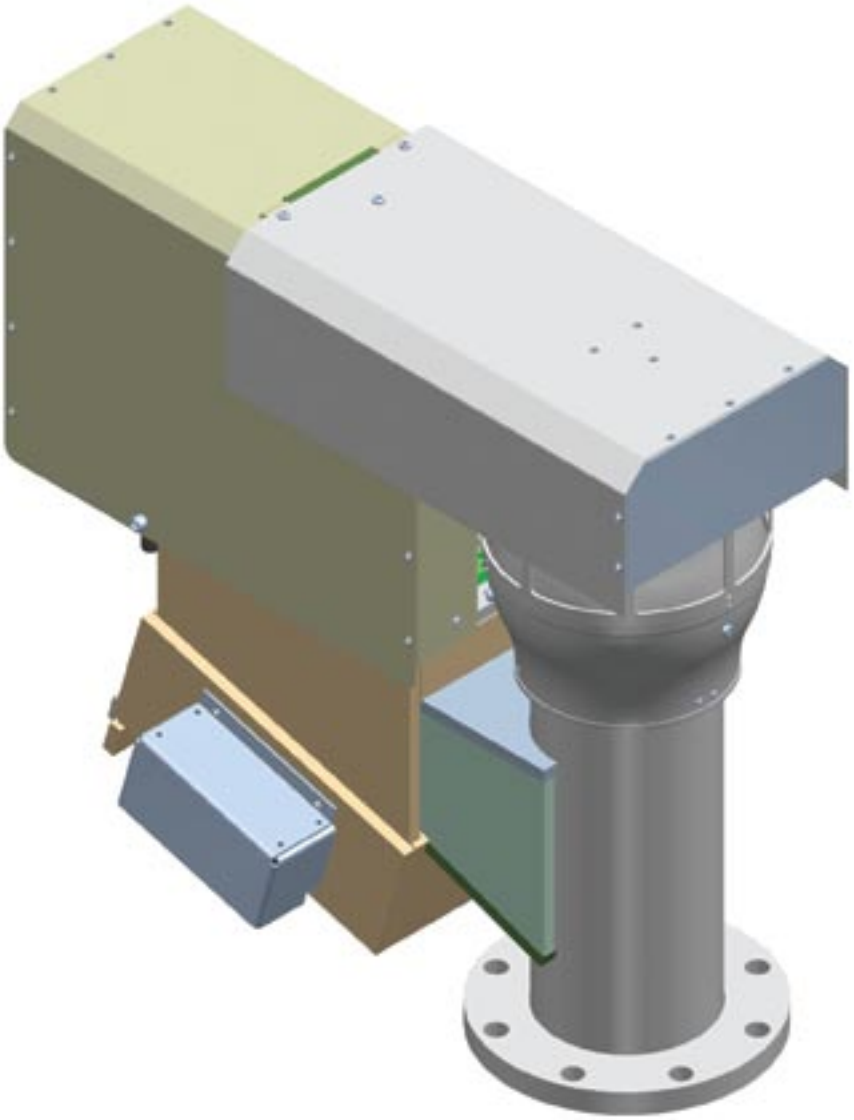
The ERL PV Valve virtually eliminates friction by eliminating sliding shafts and bushings within the valve. By using sealed stainless steel roller bearings and pivot arms outside of the vapor stream, valve reliability and set point accuracy are greatly increased.

The term, High Velocity, pertains only to the pressure side of the ERL P-V valve. This term applies to a discharge velocity greater than 30 meters/second. Discharge velocities greater than 30 meters/second are needed to prevent flame propagation into the barge. Per USCG regulations the vacuum side of the valve is protected by a 30 x30 mesh stainless steel flame screen.

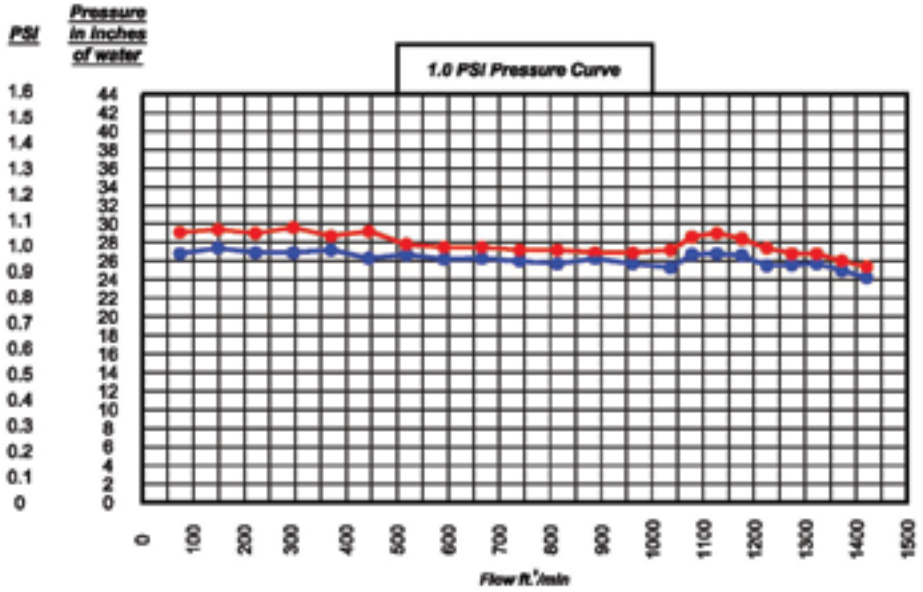
TESTING OF THE ERL PV-6 II

Per 46 CFR 39.20-11 (b)2 the ERL Superac™ High Velocity P-V Valve has the mechanical means to check both the pressure and vacuum sides of the valve to verify that they open freely. Each test lever is well identified and this test is simply performed as described in the illustration below. When testing the pressure side of the valve it does not matter if the weather cover is open or closed. During testing or normal operation, cargo vapors may be exhausted. Extreme caution should be exercised as these vapors may be harmful to personnel.

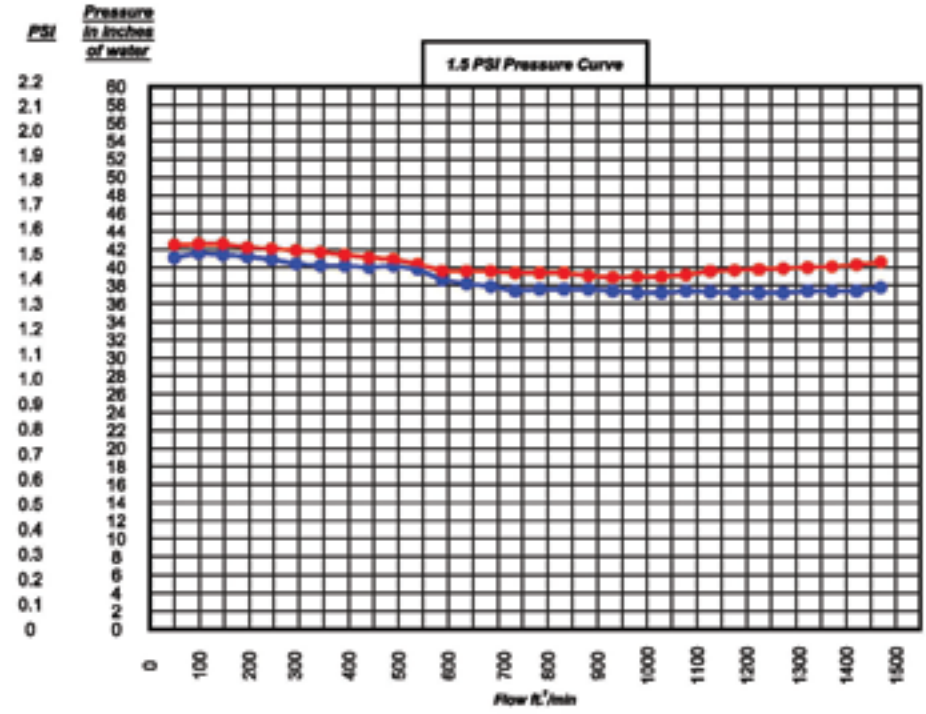
On barge pressure testing or bench testing of both pressure and vacuum valve functions can be performed by personnel trained to perform such tests. In the case of on-barge testing extreme caution should be used to avoid overpressurizing the barge. The test levers on both pressure and vacuum sides of the valve should be operated to verify the valve operates freely prior to each vessel loading.



SUPERAC™ MODEL PV-6 II PRESSURE FLOW CURVES
DATA BASED ON AIRFLOW



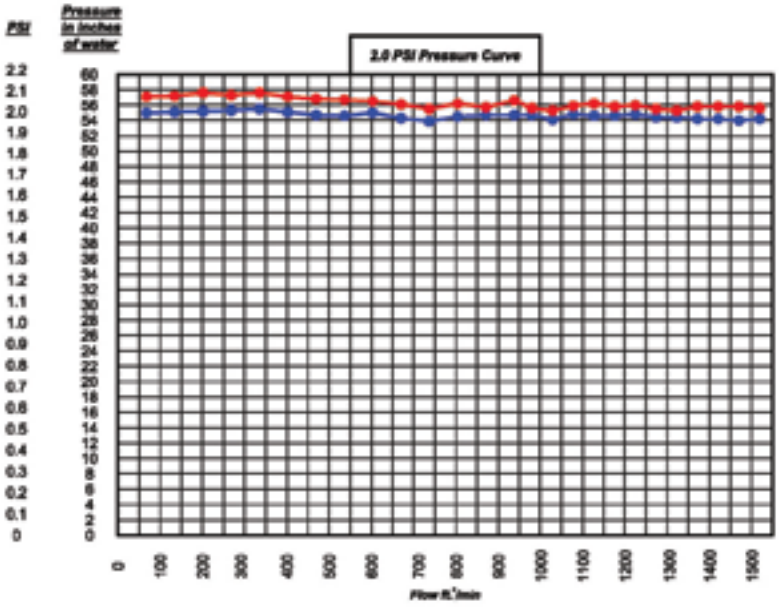
Barrels per hour	Flow ft.³/min	Pressure in inches of H_2O	
		lid closed	lid open
791	74	29.1	28.8
1572	147	29.4	27.4
2363	221	29.0	26.9
3144	294	29.6	26.9
3924	367	28.7	27.2
4716	441	29.2	26.3
5496	514	27.8	26.7
6288	588	27.5	26.2
7068	661	27.5	26.3
7860	735	27.2	26.0
8640	808	27.2	25.7
9432	882	26.9	26.3
10212	955	26.9	25.7
11004	1029	27.2	25.3
11528	1078	28.6	26.7
12052	1127	29.0	26.8
12576	1176	28.4	26.6
13100	1225	27.4	25.6
13624	1274	26.8	25.6
14148	1323	26.8	25.7
14672	1372	26.0	25.0
15196	1421	25.4	24.2



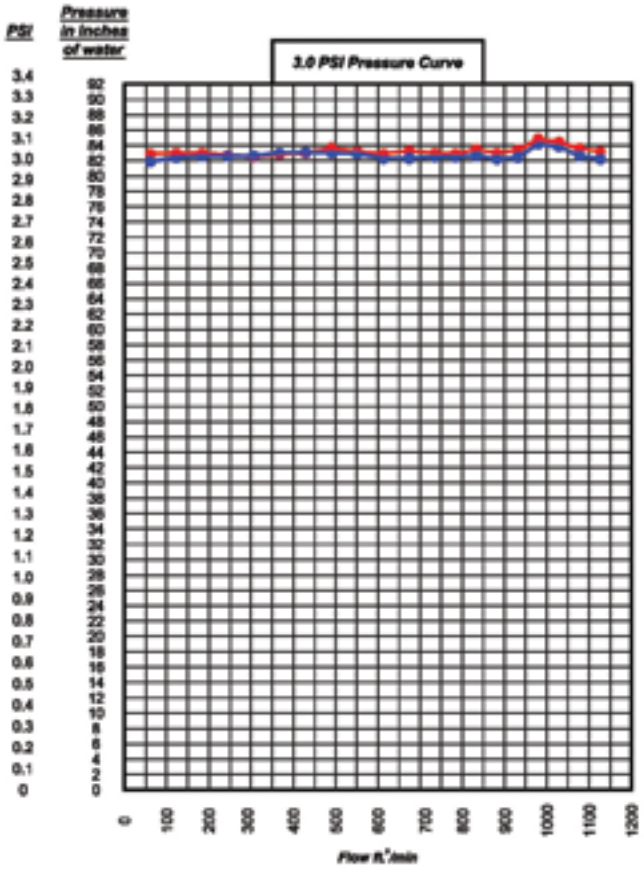
Barrels per hour	Flow ft.³/min	Pressure in inches of H_2O	
		lid closed	lid open
524	49	42.5	41.1
1048	98	42.6	41.6
1571	147	42.6	41.4
2095	196	42.2	41.2
2619	245	42.1	40.9
3143	294	41.9	40.4
3667	343	41.7	40.2
4190	392	41.4	40.2
4714	441	41.1	40.0
5238	490	40.9	40.2
5762	539	40.4	39.8
6286	588	39.8	38.6
6810	637	39.8	38.2
7333	686	39.8	37.9
7860	735	39.4	38.4
8384	784	39.4	37.8
8908	833	39.4	37.8
9932	882	39.1	37.8
9956	931	38.9	37.8
10480	980	39.0	37.2
11004	1029	39.0	37.2
11528	1078	39.2	37.4
12052	1127	39.6	37.3
12576	1176	39.7	37.2
13100	1225	39.8	37.2
13624	1274	39.9	37.2
14148	1323	40.6	37.4
14672	1372	40.1	37.4
15196	1421	40.3	37.4
15720	1470	40.8	37.8

NOTE: Pressure vs. flow curves are identical for both Model I and Model II PV-6.
The TOP curve represents closed weather cover operation and the BOTTOM curve is open cover operation.
By design, there is little or no pressure drop across the flow curve with the PV-6.

SUPERAC™ MODEL PV-6 II PRESSURE FLOW CURVES DATA BASED ON AIRFLOW



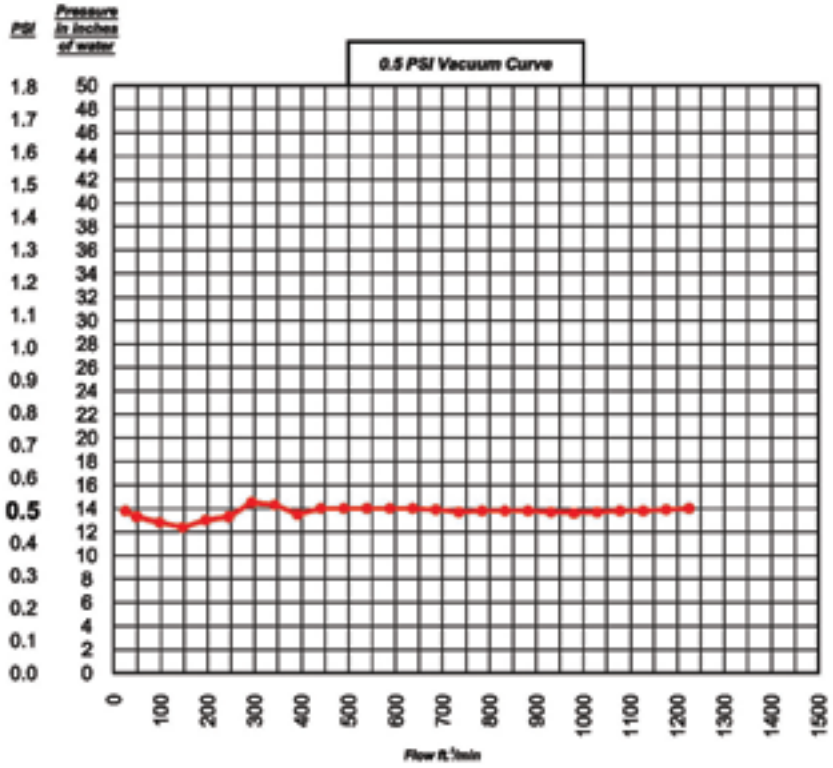
Barrels per hour	Flow ft.³/min	Pressure in inches of H_2O	
		lid closed	lid open
716	67	57.1	55.0
1422	133	57.2	55.1
2139	200	57.6	55.2
2844	266	57.3	55.3
3561	333	57.6	55.6
4266	399	57.1	55.1
4983	466	56.8	54.7
5689	532	56.7	54.6
6405	599	56.5	55.0
7111	665	56.1	54.3
7827	732	55.8	53.9
8533	798	56.2	54.5
9250	865	56.7	54.7
9956	931	56.6	54.7
10480	980	56.6	54.7
11004	1029	56.3	54.1
11528	1078	56.9	54.8
12052	1127	56.2	54.6
12576	1176	56.8	54.6
13100	1225	56.0	54.8
13624	1274	56.5	54.4
14148	1323	56.3	54.4
14672	1372	56.8	54.2
15189	1421	56.8	54.2
15713	1470	56.8	54.0
16237	1519	56.6	54.2



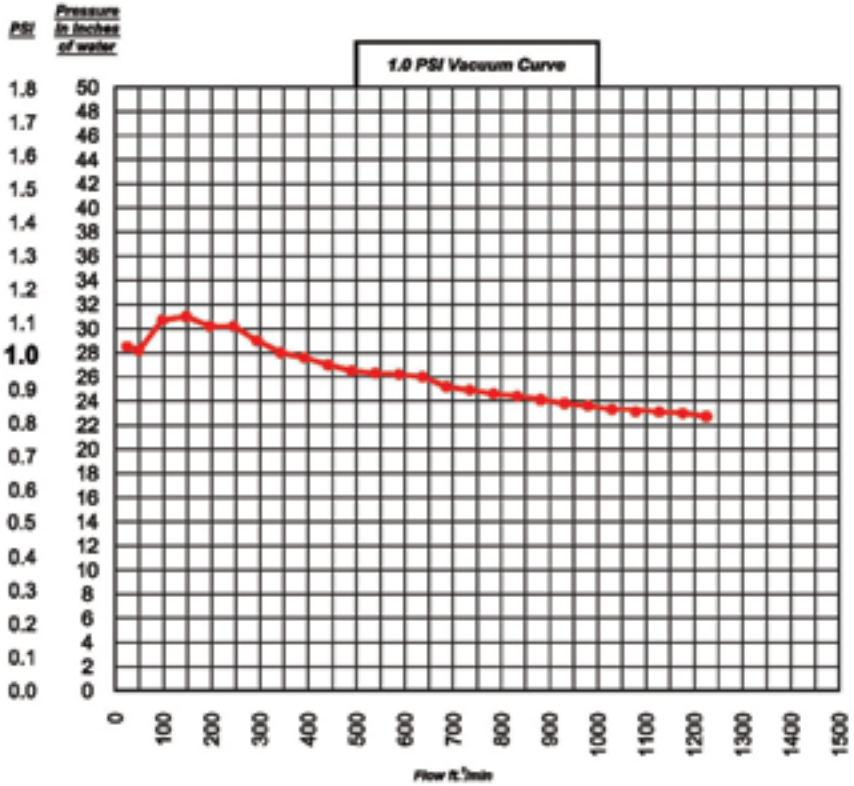
Barrels per hour	Flow ft.³/min	Pressure in inches of H_2O	
		lid closed	lid open
652	61	82.9	81.9
1304	122	83.0	82.4
1967	184	83.0	82.6
2620	245	82.7	82.6
3272	306	82.4	82.6
3924	367	82.6	83.0
4588	429	83.0	83.1
5240	490	83.7	83.0
5892	551	83.2	82.9
6555	613	82.9	82.3
7208	674	83.3	82.3
7860	735	83.0	82.5
8512	784	82.9	82.6
9165	833	83.5	82.6
9828	882	83.0	82.2
10480	931	83.4	82.4
11132	980	84.8	84.2
11784	1029	84.4	83.8
12437	1078	83.6	82.6
13092	1127	83.2	82.2

NOTE: Pressure vs. flow curves are identical for both Model I and Model II PV-6.
The TOP curve represents closed weather cover operation and the BOTTOM curve is open cover operation.

SUPERAC™ MODEL PV-6 II VACUUM FLOW CURVES DATA BASED ON AIRFLOW



Barrels per hour	Flow ft.³/min	Pressure in inches of H₂O
262	25	13.8
524	49	13.3
1048	98	12.8
1571	147	12.4
2095	196	13.0
2619	245	13.3
3143	294	14.8
3667	343	14.3
4190	392	13.5
4714	441	14.0
5238	490	14.0
5762	539	14.0
6286	588	14.0
6810	637	14.0
7333	686	13.9
7857	735	13.7
8381	784	13.8
8905	833	13.8
9429	882	13.8
9953	931	13.7
11001	980	13.8
11525	1029	13.7
12049	1078	13.8
12573	1127	13.8
13097	1176	13.9
13621	1225	14.0



Barrels per hour	Flow ft.³/min	Pressure in inches of H₂O
262	25	28.5
524	49	28.2
1048	98	30.7
1571	147	31.0
2095	196	30.2
2619	245	30.2
3143	294	29.0
3667	343	28.0
4190	392	27.6
4714	441	27.0
5238	490	26.5
5762	539	26.3
6286	588	26.2
6810	637	26.0
7333	686	25.2
7857	735	24.9
8381	784	24.6
8905	833	24.4
9429	882	24.1
9953	931	23.8
11001	980	23.6
11525	1029	23.3
12049	1078	23.1
12573	1127	23.1
13097	1176	23.0
13621	1225	22.7

SUPERAC™ MODEL PV-6II

Model PV-6 II with weather cover closed.

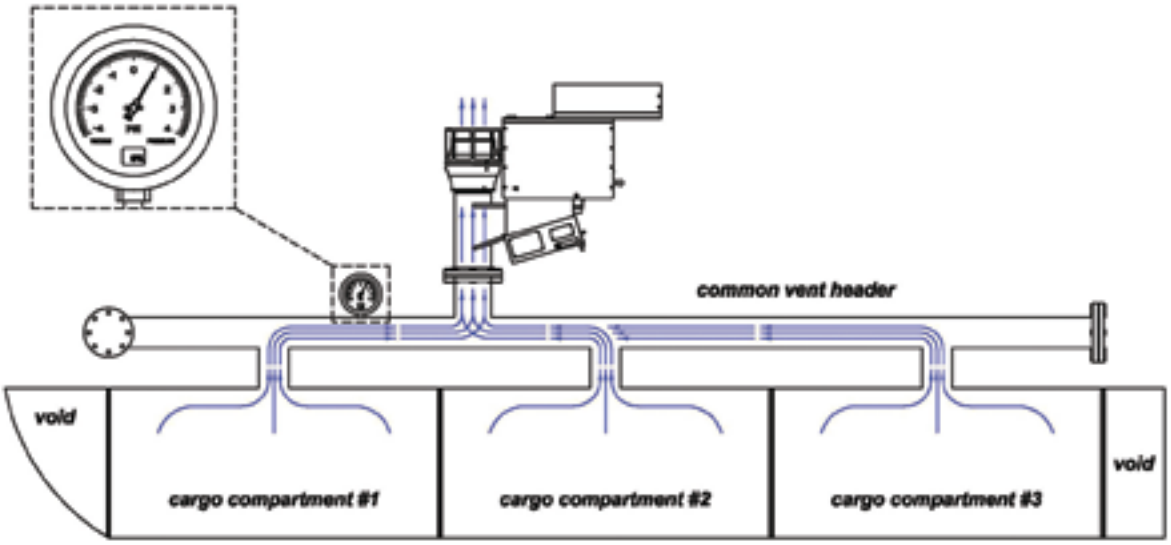
Model PV-6 II with weather cover open.

PV-6 II PEFORMANCE

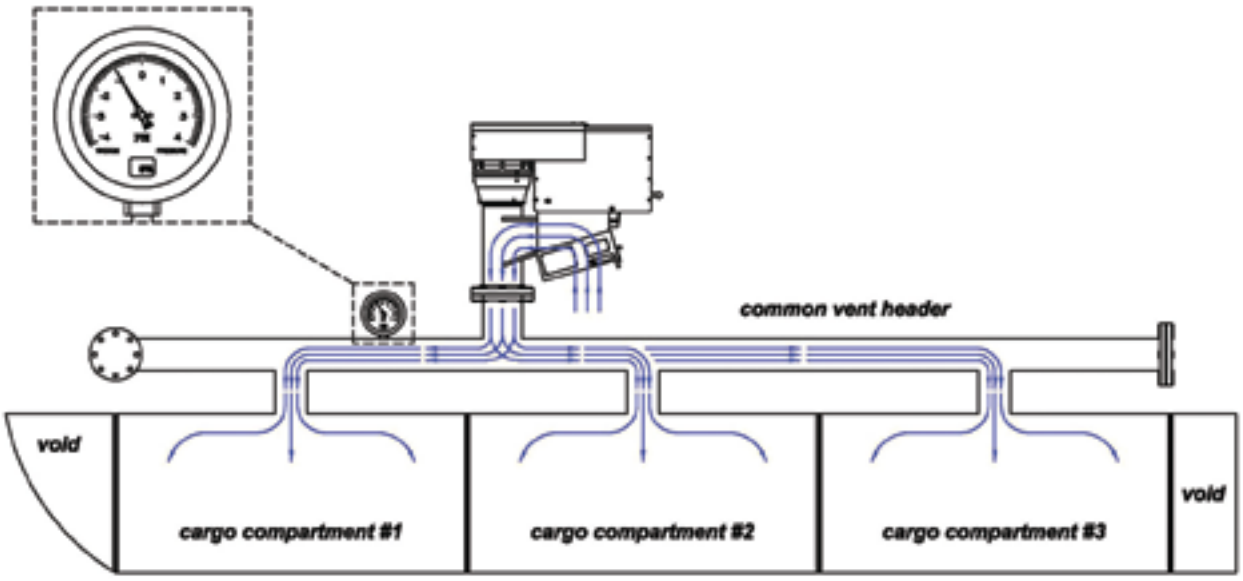
Superac 6" High Velocity PV Valve Model II mounted on collapsible vapor pipe.

NOTE: The velocity of the PV-6 discharge is measured with a precision hot wire anemometer at the valve seat. The minimum recorded velocity of the PV-6 is 40 meters/second. At flow volumes exceeding 150 cubic feet/minute the PV-6's flow velocity is in excess of 50 meters/second, which is at the upper limit indicated by the instrument (hot wire anemometer) used for velocity discharge testing.

PV-6 II - PERFORMANCE

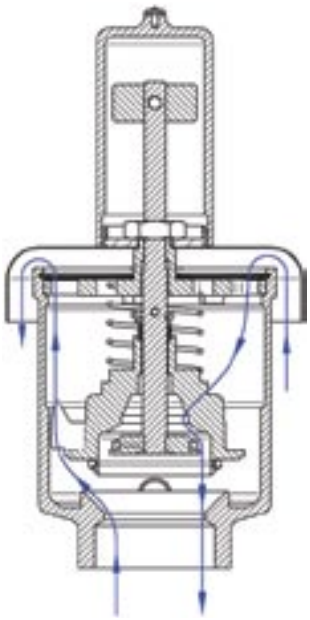


Flow Schematic During Pressure Build-up Situation



Flow Schematic During Vacuum Build-up Situation

EQUATE™SERIES PRESSURE/VACUUM RELIEF VALVE
EQUATE™ PV-2.5

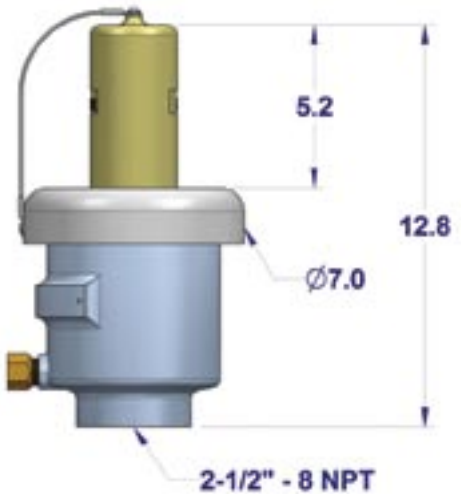


- **AUTOMATIC OPERATION**
  The Equate PV-2.5, 2.5" P-V Valve is designed to automatically maintain safe design working pressure and vacuum levels within your barge. Your barge remains closed vapor tight until set point pressure or vacuum overcomes the force of each respective set point spring, allowing vapor flow out or air flow in, at a rate sufficient to maintain safe levels within your barge.

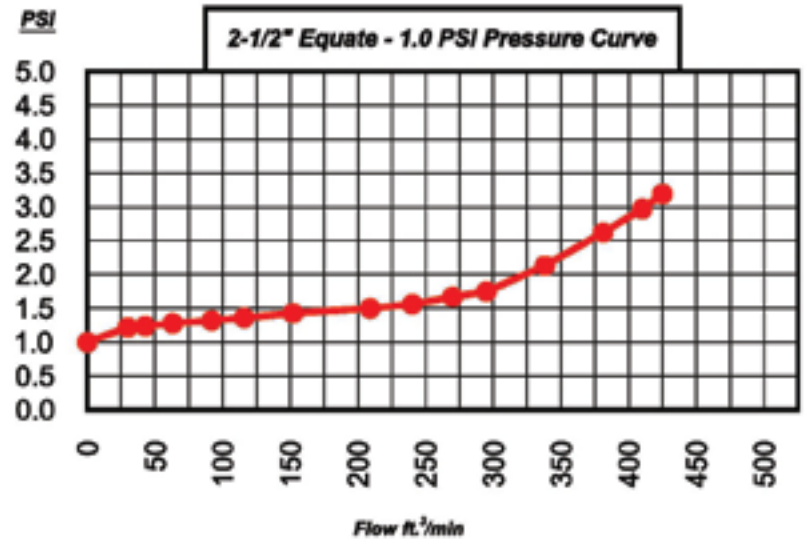
- **SIMPLER DESIGN**
  Having very few parts, the Equate P-V valve is spring operated with one spring to determine the pressure set opening point and the second spring to determine the vacuum set opening point. A manual test handle allows the tankerman to check operation of both the pressure and vacuum sides of the valve. Both the test handle and valve weather covers are easily removed allowing complete valve inspection in minutes. Easy to replace elastomer seals, one pressure and one vacuum seal, insure vapor tightness.

- **100% STAINLESS STEEL**
  All components are 300 series stainless steel for extended service life and reduce need for maintenance. The resilient pressure and vacuum seals are the only parts that are not stainless steel.

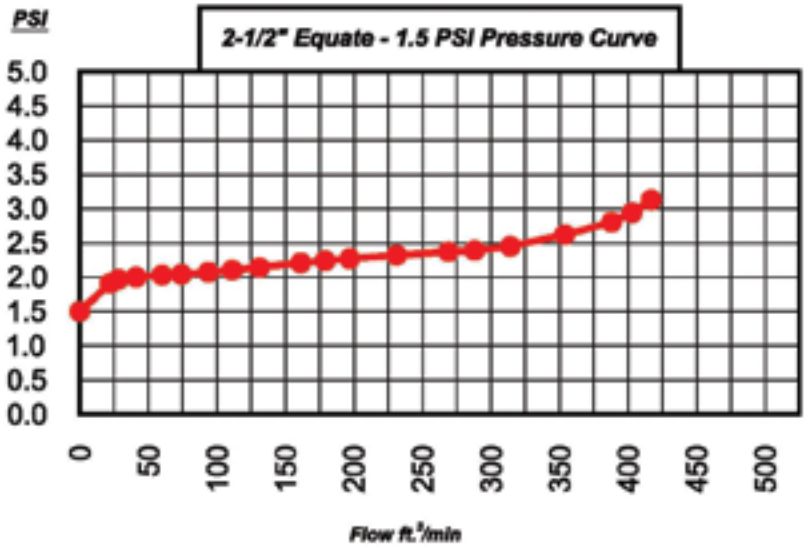
- **CERTIFIED TO MEET ALL USCG REQUIREMENTS**
  Every Equate P-V Valve is 100% factory tested prior to shipment and is USCG Approved.



EQUATE™ SERIES 2.5" PV VALVE PRESSURE FLOW CURVES DATA BASED ON AIRFLOW

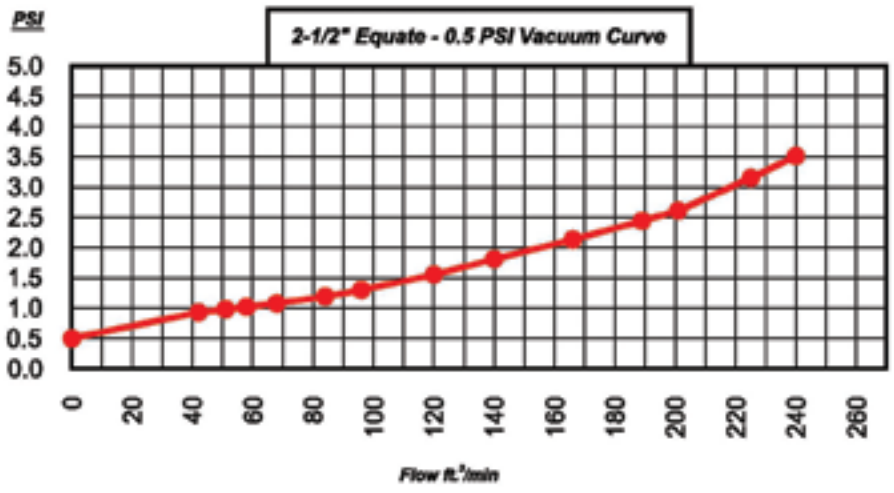


Barrels per hour	Flow ft.³/min	Pressure in inches of H₂O
321	30	1.22
460	43	1.24
674	63	1.28
984	92	1.32
1241	116	1.36
1626	152	1.43
2236	209	1.50
2568	240	1.56
2889	270	1.67
3157	295	1.75
3617	338	2.13
4077	381	2.62
4387	410	2.97
4548	425	3.19

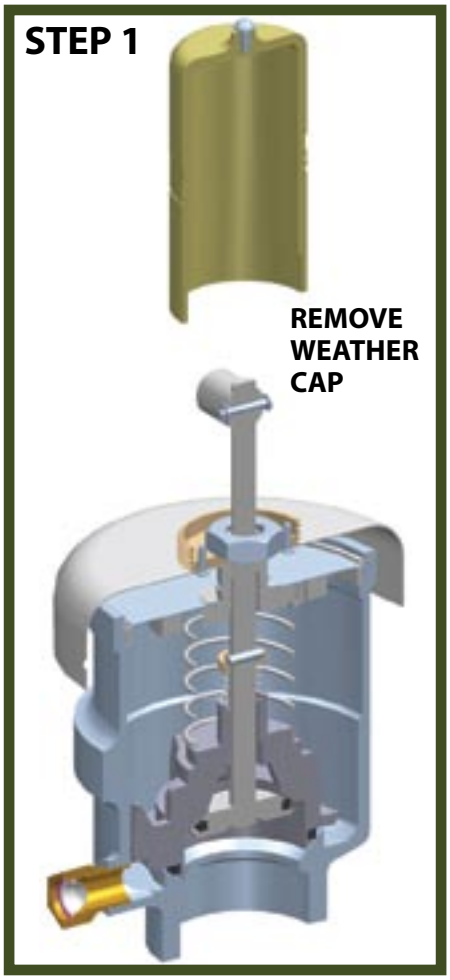


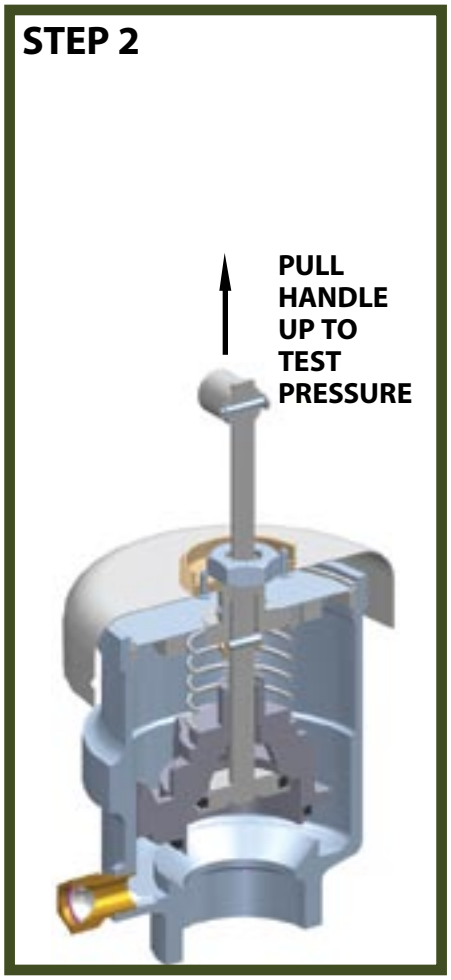
Barrels per hour	Flow ft.³/min	Pressure in inches of H₂O
235	22	1.91
300	28	1.97
439	41	2.00
642	60	2.03
792	74	2.04
1006	94	2.07
1188	111	2.10
1402	131	2.14
1723	161	2.21
1915	179	2.24
2108	197	2.27
2472	231	2.32
2878	269	2.37
3081	288	2.39
3360	314	2.45
3788	354	2.62
4152	388	2.80
4312	403	2.94
4462	417	3.13

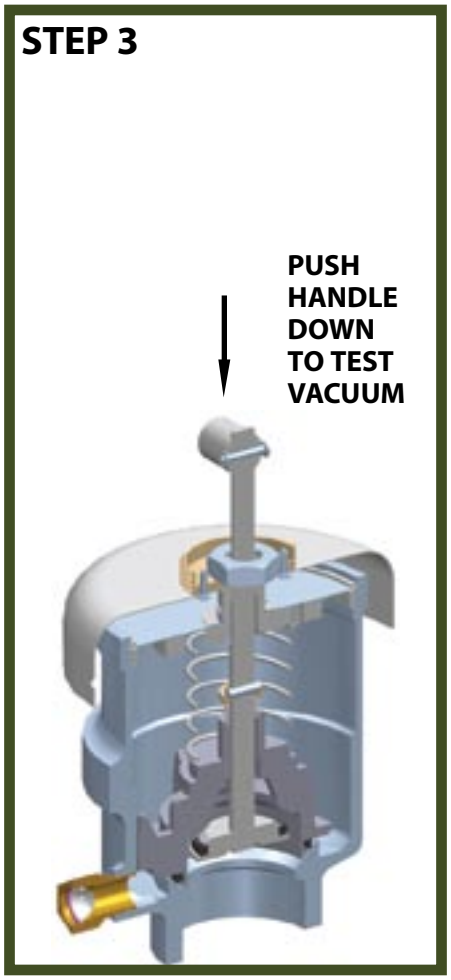
EQUATE™ SERIES 2.5" PV VALVE VACUUM FLOW CURVE DATA BASED ON AIRFLOW



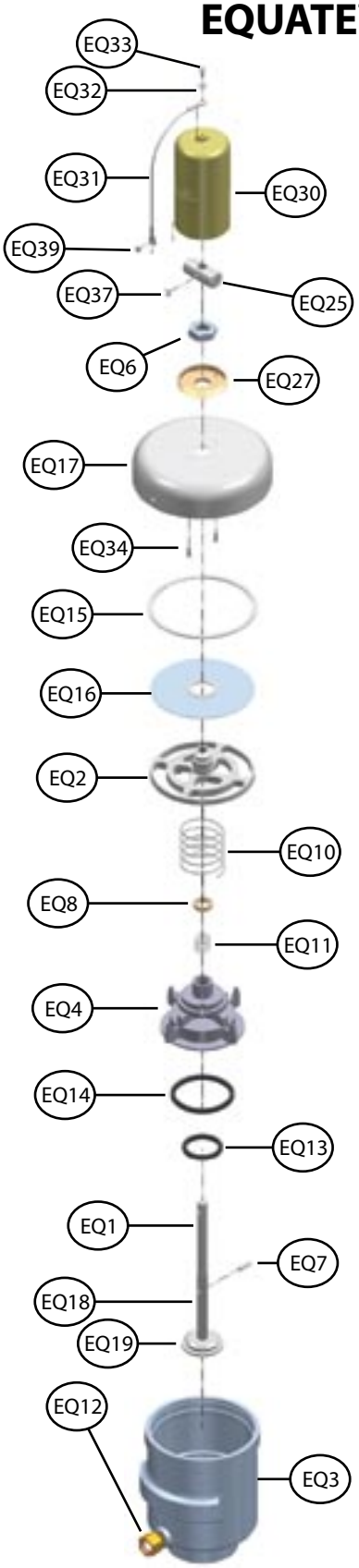
Barrels per hour	Flow ft.³/min	Pressure in inches of H₂O
449	42	0.93
546	51	0.98
621	58	1.02
728	68	1.08
899	84	1.19
1027	96	1.30
1284	120	1.55
1498	140	1.81
1776	166	2.13
2022	189	2.44
2151	201	2.61
2408	225	3.15
2568	240	3.51







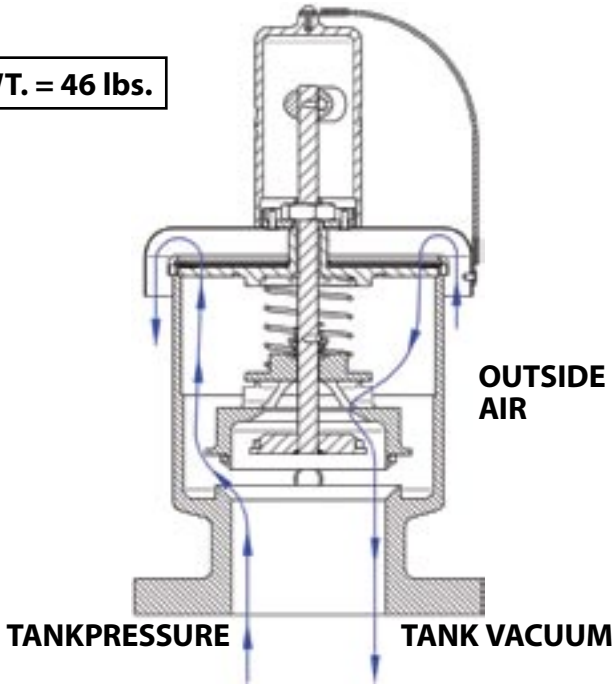
EQUATE™ SERIES 2.5" PV VALVE



Item	Part Name	Qty.
EQ1	Stem, weldment	1
EQ2	Top Retainer	1
EQ3	Main Body	1
EQ4	Follower	1
EQ6	Hex Jam Nut, 3/4-16	1
EQ7	Dowel Pin, 3/16 x 3/4	1
EQ8A	Spring Retainer	1
EQ9	Ext. Retaing Ring, 1"	1
EQ10	Spring, pressure	
EQ11	Spring, vacuum	
EQ12	Drain Plug	
EQ13	Quadring, vacuum	1
EQ14	Quadring, pressure	1
EQ15	Spiral Retn. Ring	1
EQ16	Flame Screen	1
EQ17	Cover	1
EQ18	Stem	1
EQ19	Seal Holder	1
EQ20	Follower (casting)	1
EQ21	Main Body (casting)	1
EQ22	Top Retainer (casting)	1
EQ23	Internal Retaining Ring, 3/4"	1
EQ24	Plug Screen	1
EQ25	Test Knob	1
EQ26	Clevis Pin w/EQ37, 3/16 x 1	1
EQ27	Threaded Bushing	1
EQ30	Knob Cover	1
EQ31	Lanyard (same as D10)	1
EQ32	Flat Washer, #10 (same as D33)	1
EQ33	Drive Screw, #10 x 1/2" (same as D11)	1
EQ34	Rivit, 3/16, long	2
EQ35	I.D. Tag	1
EQ36	Drive Screw, #6 x 1/4" (same as D13)	2
EQ37	E-Clip w/EQ26	1
EQ39	Rivit, 3/16, small	1

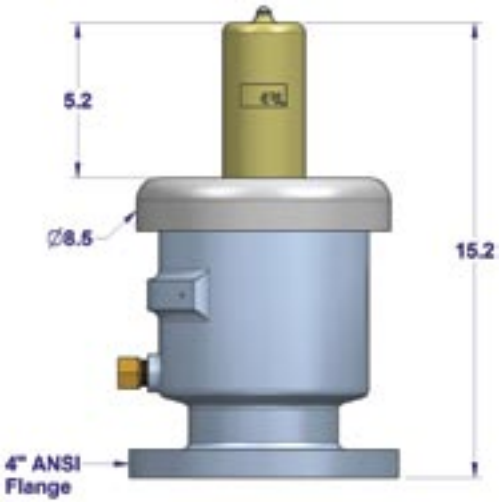
EQUATE™ SERIES PRESSURE/VACUUM RELIEF VALVE
EQUATE™ PV-4

WT. = 46 lbs.



- **AUTOMATIC OPERATION**
  The Equate PV-4, 4" P-V Valve is designed to automatically maintain safe design working pressure and vacuum levels within your barge. Your barge remains closed vapor tight until set point pressure or vacuum overcomes the force of each respective set point spring, allowing vapor flow out or air flow in, at a rate sufficient to maintain safe levels within your barge.

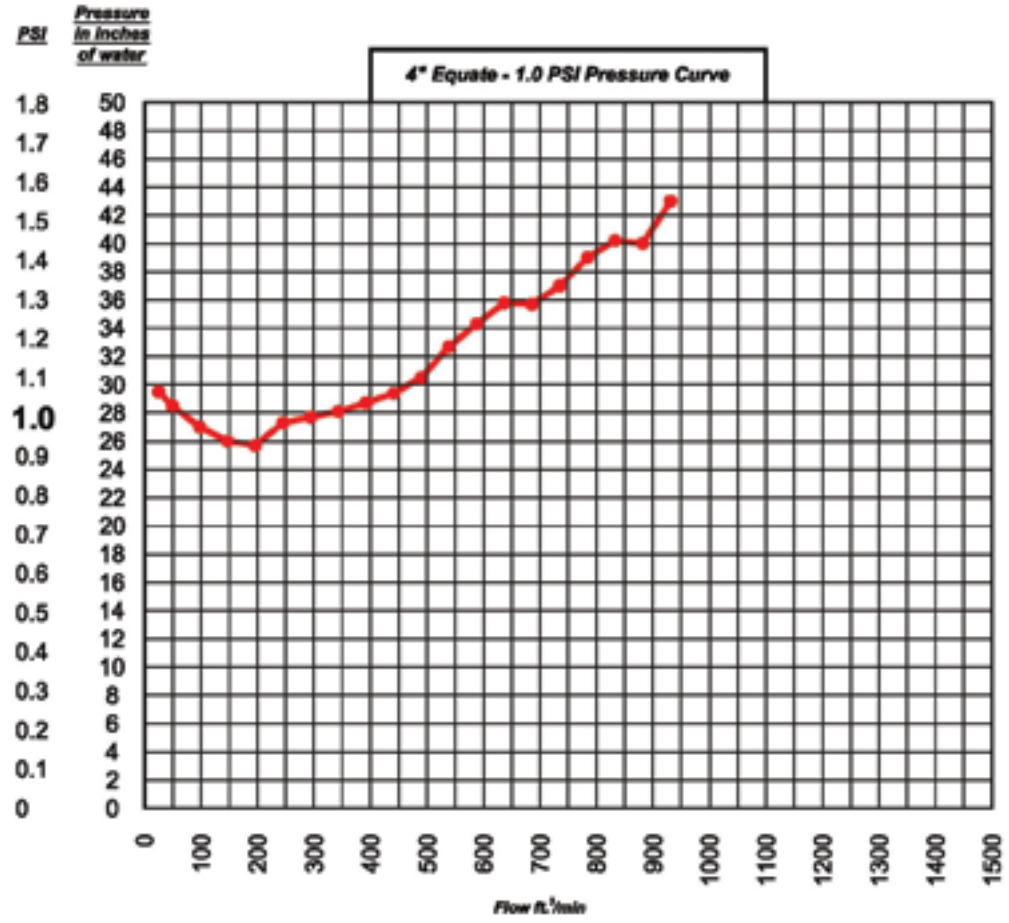
- **SIMPLE DESIGN**
  Having very few parts, the Equate P-V valve is spring operated with one spring to determine the pressure set opening point and the second spring to determine the vacuum set opening point. A manual test handle allows the tankerman to check operation of both the pressure and vacuum sides of the valve. Both the test handle and valve weather covers are easily removed allowing complete valve inspection in minutes. Easy to replace elastomer seals, one pressure and one vacuum seal, insure vapor tightness.



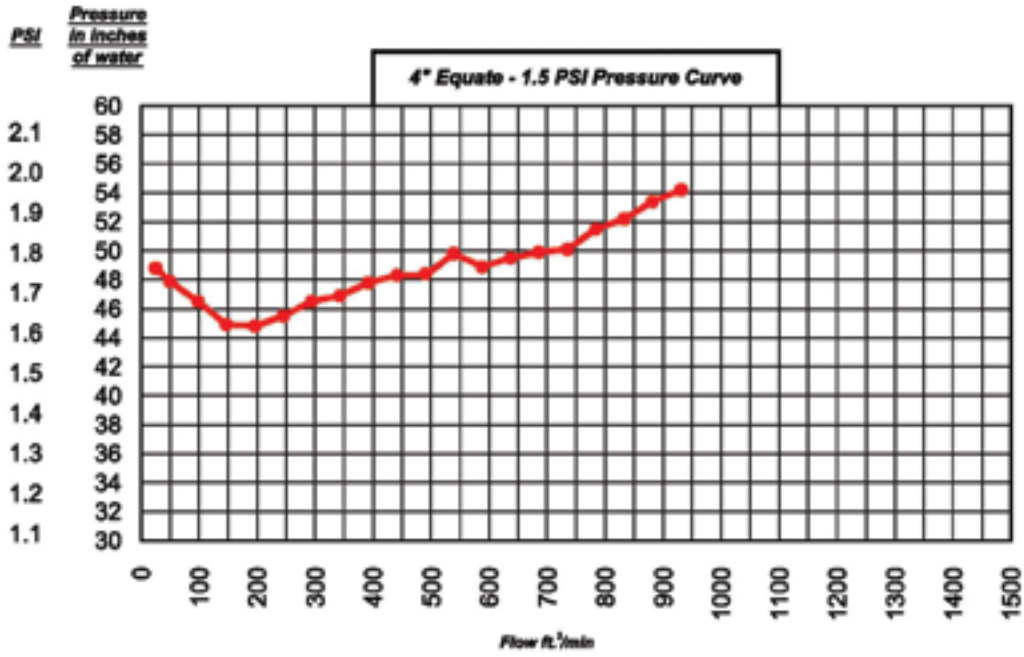
- **100% STAINLESS STEEL**
  All components are 300 series stainless steel for extended service life and reduce need for maintenance. The resilient pressure and vacuum seals are the only parts that are not stainless steel.

- **CERTIFIED TO MEET ALL USCG REQUIREMENTS**
  Every Equate P-V Valve is 100% factory tested prior to shipment and is USCG Approved.

EQUATE™ SERIES 4" PV VALVE PRESSURE FLOW CURVES DATA BASED ON AIRFLOW

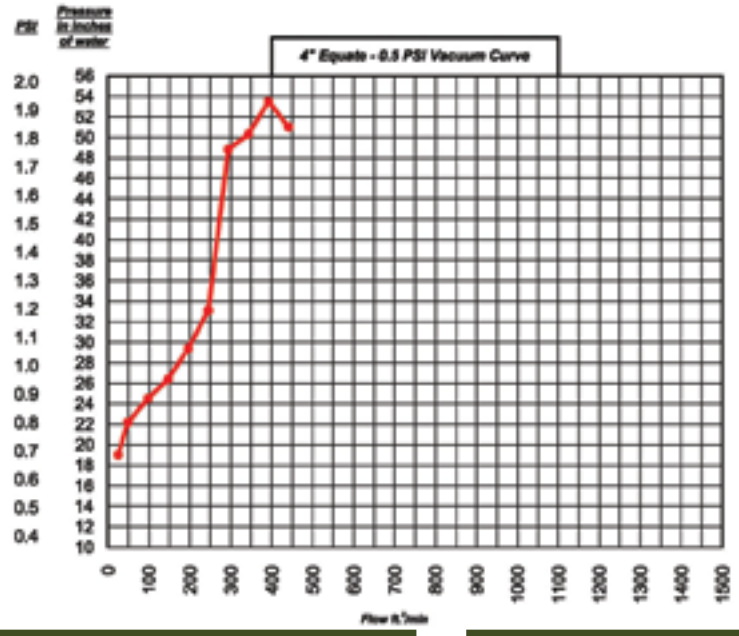


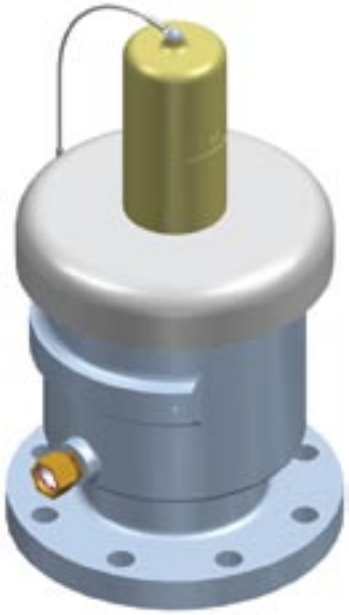
Barrels per hour	Flow ft.³/min	Pressure in inches of H2O
262	25	29.5
524	49	28.5
1048	98	27.0
1571	147	26.0
2095	196	25.7
2619	245	27.3
3143	294	27.7
3667	343	28.1
4190	392	28.7
4714	441	29.4
5238	490	30.5
5762	539	32.7
6286	588	34.3
6810	637	35.8
7333	686	35.7
7857	735	37.0
8381	784	39.0
8905	833	40.2
9429	882	40.0
9953	931	43.0

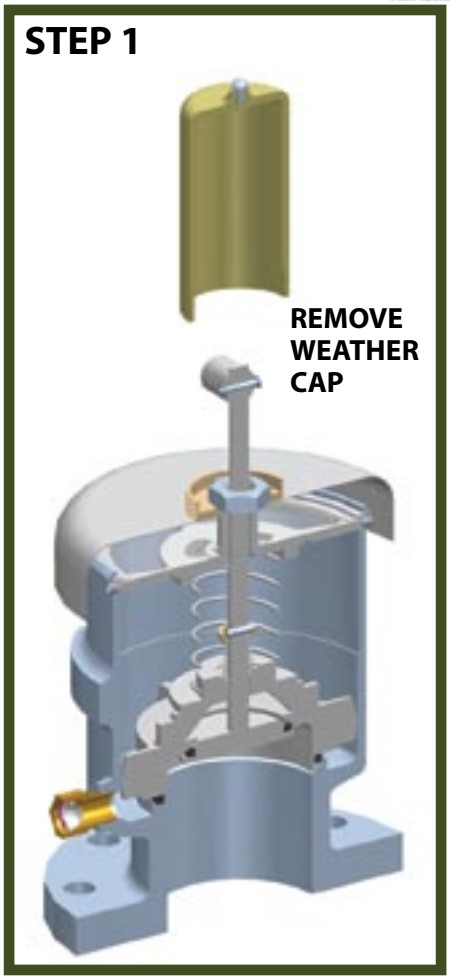


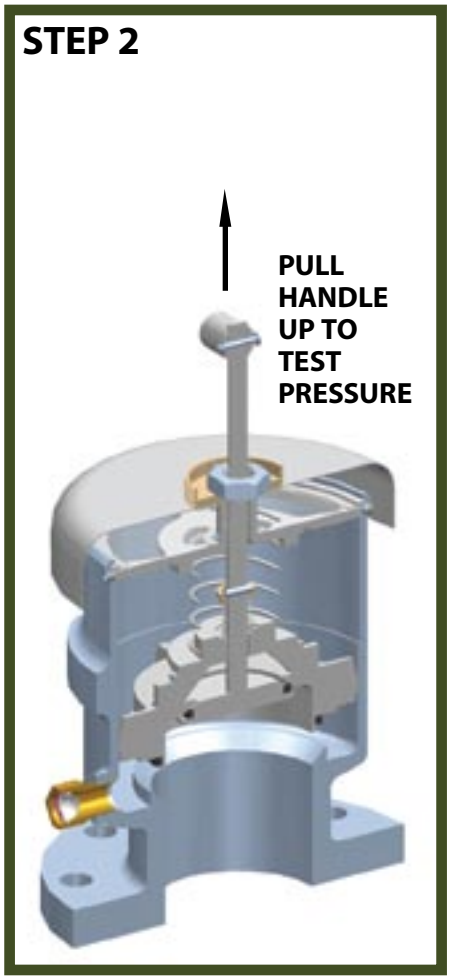
Barrels per hour	Flow ft.³/min	Pressure in inches of H2O
262	25	46.8
524	49	47.9
1048	98	46.5
1571	147	44.9
2095	196	44.8
2619	245	45.5
3143	294	46.5
3667	343	46.9
4190	392	47.8
4714	441	48.3
5238	490	48.4
5762	539	49.8
6286	588	48.9
6810	637	49.5
7333	686	49.9
7857	735	50.1
8381	784	51.5
8905	833	52.2
9429	882	53.4
9953	931	54.2

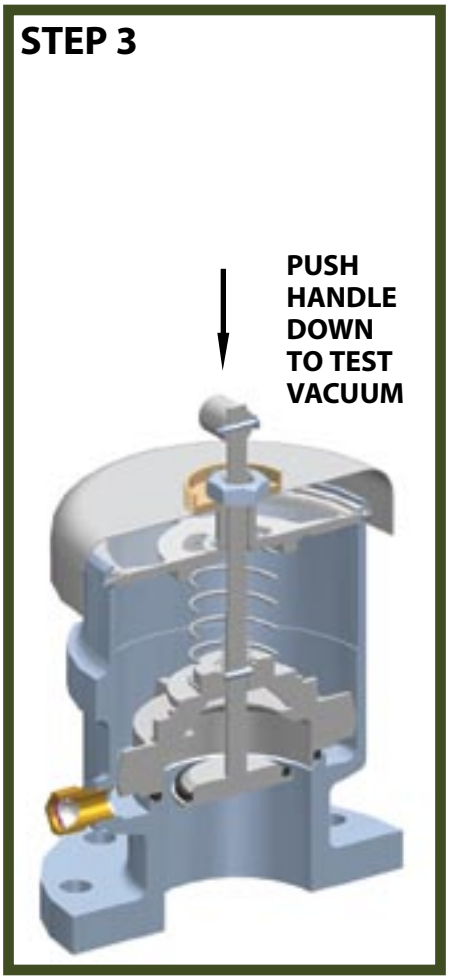
EQUATE™ SERIES 4" PV VALVE VACUUM FLOW CURVE DATA BASED ON AIRFLOW



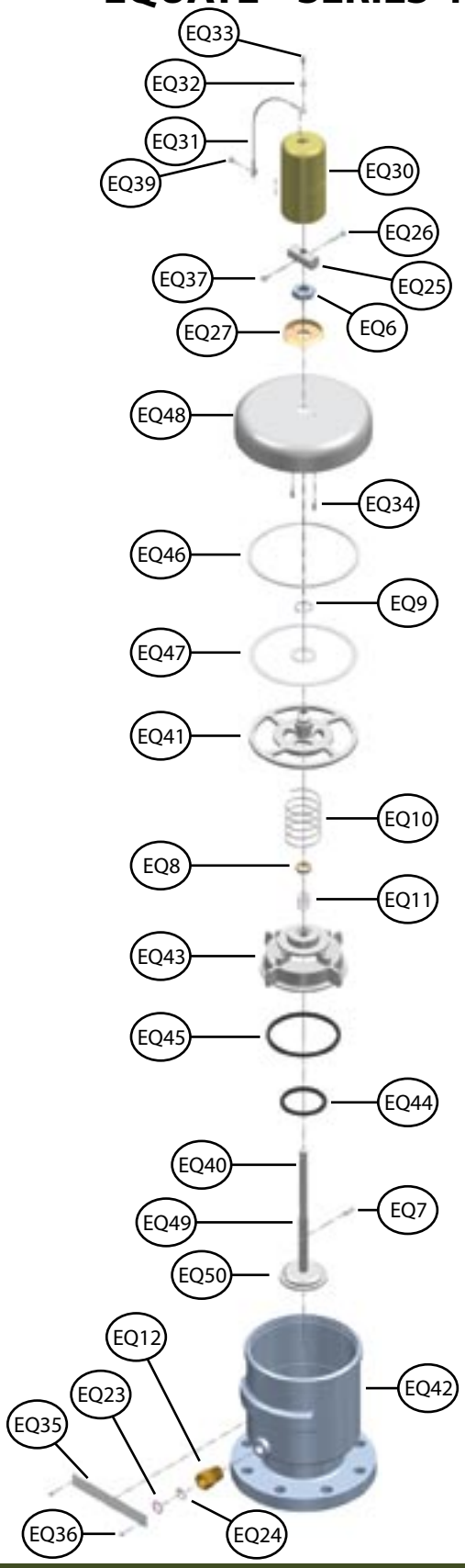








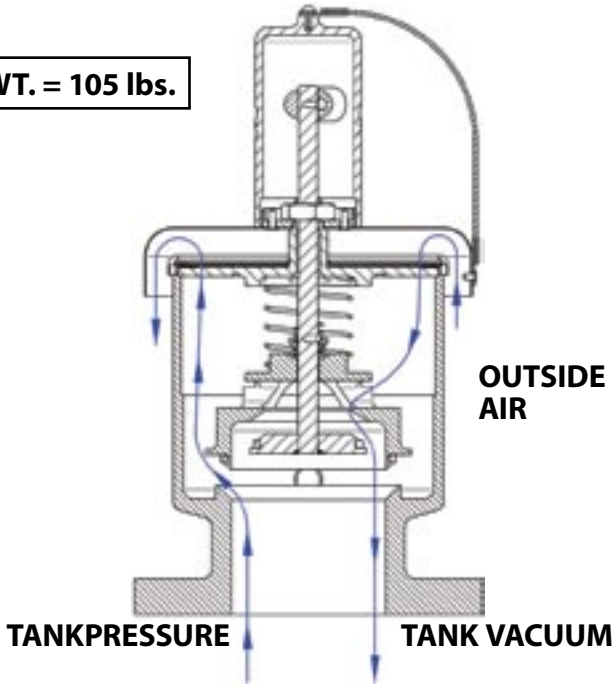
EQUATE™ SERIES 4” PRESSURE/VACUUM RELIEF VALVE



Item	Part Name	Qty.
EQ6	Hex Jam Nut, 3/4-16	1
EQ7	Dowel Pin, 3/16 x 3/4	1
EQ8-A	Spring Retainer	1
EQ9	Ext. Retaing Ring, 1”	1
EQ10	Spring, pressure	see cht
EQ11	Spring, vacuum	see cht
EQ12	Drain Plug	
EQ23	Internal Retaining Ring, 3/4”	1
EQ24	Plug Screen	1
EQ25	Test Knob	1
EQ26	Clevis Pin w/EQ37, 3/16 x 1	1
EQ27	Threaded Bushing	1
EQ30	Knob Cover	1
EQ31	Lanyard (same as D10)	1
EQ32	Flat Washer, #10 (same as D33)	1
EQ33	Drive Screw, #10 x 1/2” (same as D11)	1
EQ34	Rivit, 3/16, long	2
EQ35	I.D. Tag	1
EQ36	Drive Screw, #6 x 1/4” (same as D13)	2
EQ37	E-Clip w/EQ26	1
EQ39	Rivit, 3/16, small	1
EQ40	Stem, weldment	1
EQ41	Top Retainer	1
EQ42	Main Body	1
EQ43	Follower	1
EQ44A	Quadring, vacuum	1
EQ44B	Quadring, vacuum	1
EQ45A	Quadring, pressure	1
EQ45B	Quadring, pressure	1
EQ46	Spiral Retn. Ring	1
EQ47	Flame Screen	1
EQ48	Cover	1
EQ49A	Stem	1
EQ49B	Stem, 2PSI	1
EQ50	Seal Holder	1
EQ51	Follower (casting)	1
EQ52	Main Body (casting)	1
EQ53	Top Retainer (casting)	1

EQUATE™ SERIES PRESSURE/VACUUM RELIEF VALVE
EQUATE™ PV-8

WT. = 105 lbs.

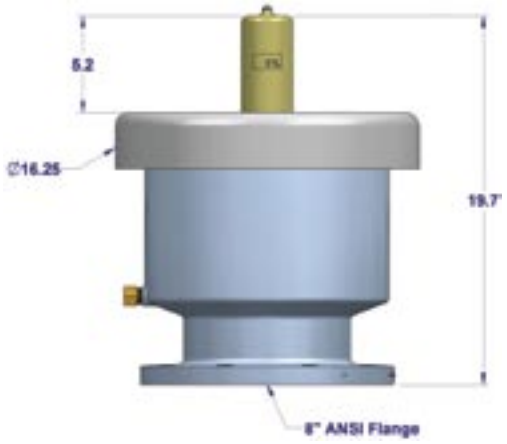


- **AUTOMATIC OPERATION**
  The Equate PV-8, 8" P-V Valve is designed to automatically maintain safe design working pressure and vacuum levels within your barge. Your barge remains closed vapor tight until set point pressure or vacuum overcomes the force of each respective set point spring, allowing vapor flow out or air flow in, at a rate sufficient to maintain safe levels within your barge.

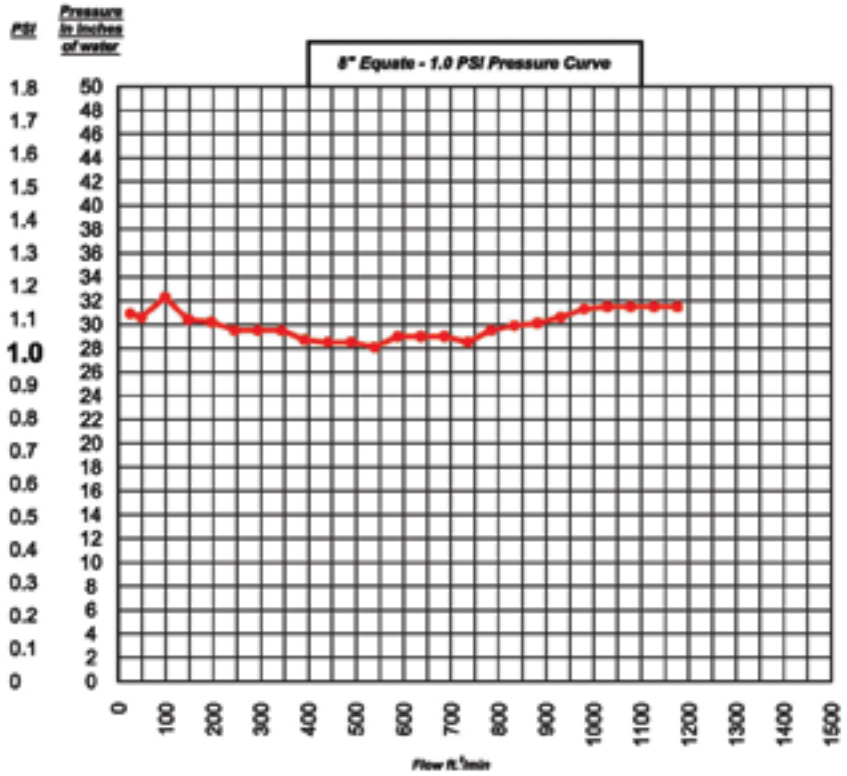
- **SIMPLE DESIGN**
  Having very few parts, the Equate P-V valve is spring operated with one spring to determine the pressure set opening point and the second spring to determine the vacuum set opening point. A manual test handle allows the tankerman to check operation of both the pressure and vacuum sides of the valve. Both the test handle and valve weather covers are easily removed allowing complete valve inspection in minutes. Easy to replace elastomer seals, one pressure and one vacuum seal insure vapor tightness.

- **100% STAINLESS STEEL**
  All components are 300 series stainless steel for extended service life and reduce need for maintenance. The resilient pressure and vacuum seals are the only parts that are not stainless steel.

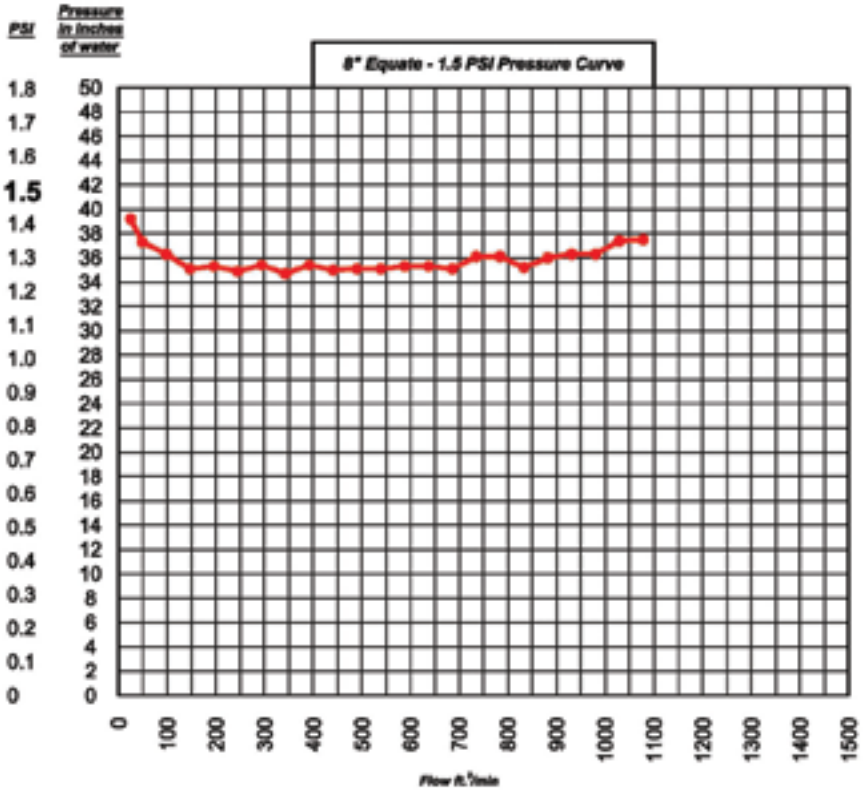
- **CERTIFIED TO MEET ALL USCG REQUIREMENTS**
  Every Equate P-V Valve is 100% factory tested prior to shipment and is USCG Approved.



EQUATE™ SERIES 8" PV VALVE PRESSURE FLOW CURVES DATA BASED ON AIRFLOW

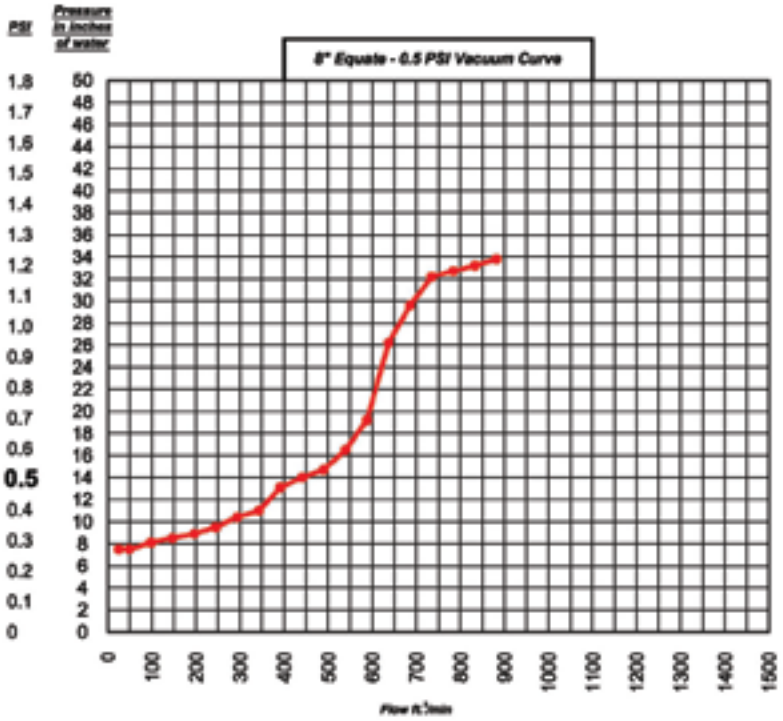


Barrels per hour	Flow ft.³/min	Pressure in inches of H₂O
262	25	30.9
524	49	30.6
1048	98	32.3
1571	147	30.4
2095	196	30.2
2619	245	29.5
3143	294	29.5
3667	343	29.1
4190	392	28.7
4714	441	28.5
5238	490	28.5
5762	539	28.1
6286	588	29.0
6810	637	29.0
7333	686	29.0
7857	735	28.5
8381	784	29.5
8905	833	29.9
9429	882	30.1
9953	931	30.6
11001	980	31.3
11525	1029	31.5
12049	1078	31.5
12573	1127	31.5
13097	1176	31.5



Barrels per hour	Flow ft.³/min	Pressure in inches of H₂O
262	25	39.2
524	49	37.3
1048	98	36.3
1571	147	35.1
2095	196	35.3
2619	245	34.9
3143	294	35.4
3667	343	34.7
4190	392	35.4
4714	441	35.0
5238	490	35.1
5762	539	35.1
6286	588	35.3
6810	637	35.3
7333	686	35.1
7857	735	36.1
8381	784	36.1
8905	833	35.2
9429	882	36.0
9953	931	36.3
11001	980	36.3
11525	1029	37.4
12049	1078	37.5

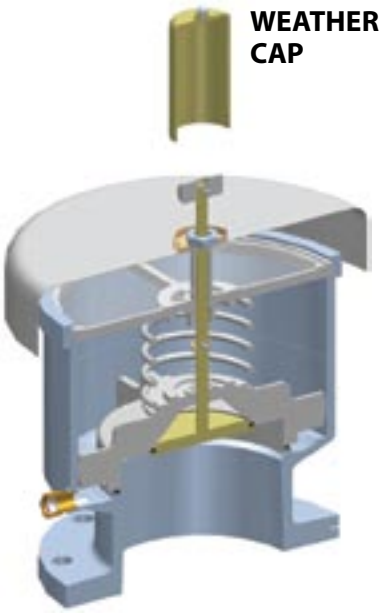
EQUATE™ SERIES 8" PV VALVE VACUUM FLOW CURVE DATA BASED ON AIRFLOW



Barrels per hour	Flow Ft³/min	Pressure in inches of H₂O
262	25	7.5
524	49	7.5
1048	98	8.1
1571	147	8.5
2095	196	8.9
2619	245	9.5
3143	294	10.4
3667	343	11.0
4190	392	13.1
4714	441	14.0
5238	490	14.7
5762	539	16.5
6286	588	19.2
6810	637	26.2
7333	686	29.6
7857	735	32.2
8381	784	32.7
8905	833	33.2
9429	882	33.8

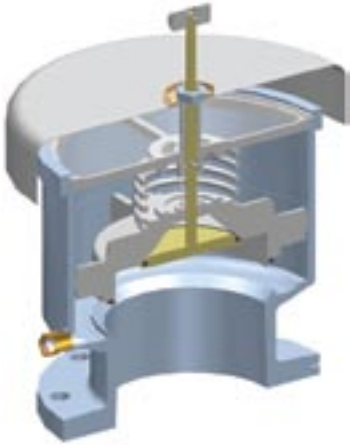
STEP 1

REMOVE WEATHER CAP



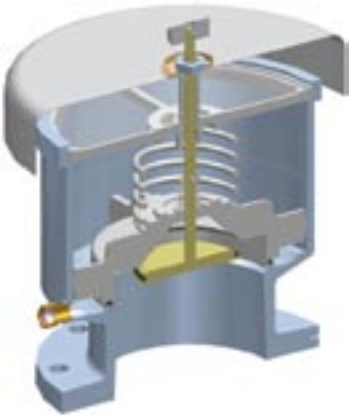
STEP 2

PULL HANDLE UP TO TEST PRESSURE

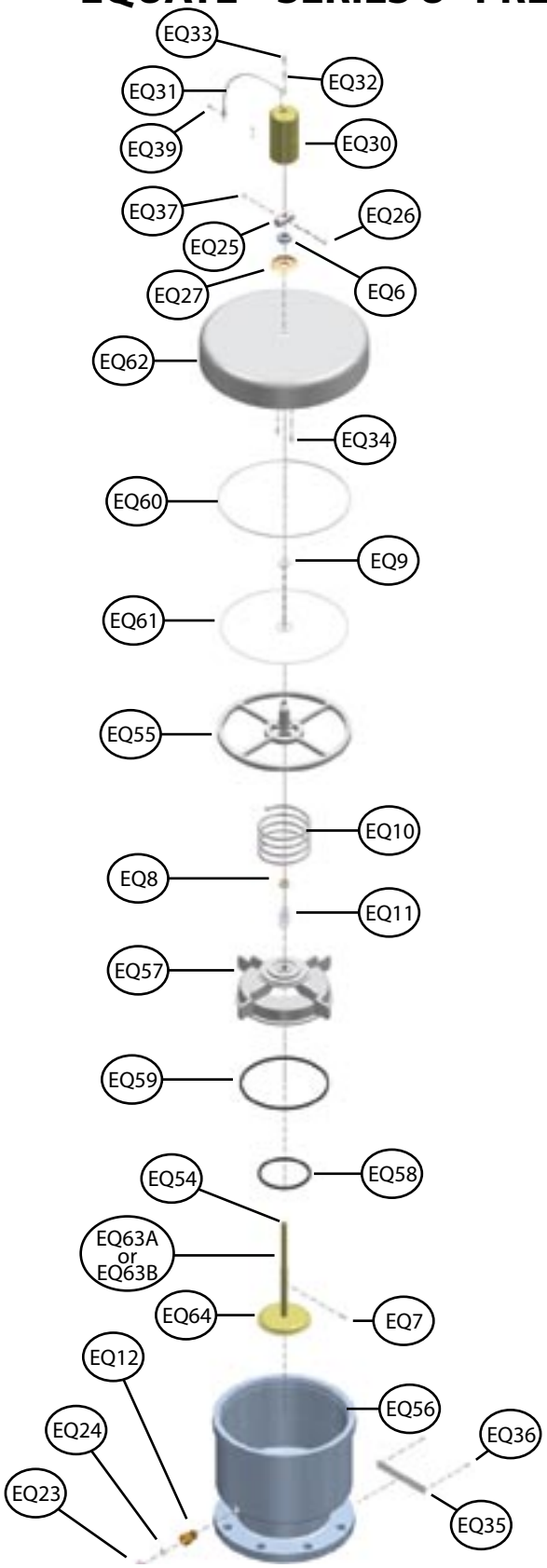


STEP 3

PUSH HANDLE DOWN TO TEST VACUUM



EQUATE™ SERIES 8” PRESSURE/VACUUM RELIEF VALVE



Item	Part Name	Qty.
EQ6	Hex Jam Nut, 3/4-16	1
EQ7	Dowel Pin, 3/16 x 3/4	1
EQ8-A	Spring Retainer	1
EQ8-B	Spring Retainer, 3PSI	1
EQ9	Ext. Retaing Ring, 1”	1
EQ10	Spring, pressure	see cht.
EQ11	Spring, vacuum	see cht.
EQ12	Drain Plug	
EQ23	Internal Retaining Ring, 3/4”	1
EQ24	Plug Screen	1
EQ25	Test Knob	1
EQ26	Clevis Pin w/EQ37, 3/16 x 1	1
EQ27	Threaded Bushing	1
EQ30	Knob Cove	1
EQ31	Lanyard (same as D10)	1
EQ32	Flat Washer, #10 (same as D33)	1
EQ33	Drive Screw, #10 x 1/2” (same as D11)	1
EQ34	Rivit, 3/16, long	2
EQ35	I.D. Tag	1
EQ36	Drive Screw, #6 x 1/4” (same as D13)	2
EQ37	E-Clip w/EQ26	1
EQ39	Rivit, 3/16, small	1
EQ54	Stem, weldment	1
EQ55	Top Retainer	1
EQ56	Main Body	1
EQ57	Follower	1
EQ58A	Quadring, vacuum	1
EQ58B	Quadring, vacuum	1
EQ59A	Quadring, pressure	1
EQ59B	Quadring, pressure	1
EQ60	Spiral Retn. Ring	1
EQ61	Flame Screen	1
EQ62	Cover	1
EQ63A	Stem	1
EQ63B	Stem, 3PSI	
EQ64	Seal Holder	1
EQ65	Follower (casting)	1
EQ66	Main Body (casting)	1
EQ67	Top Retainer (casting)	1

PRESSURE VACUUM GAUGES
BOURDON TUBE TYPE

ERL Model 505 PV Gauge

- **HEAVY DUTY STAINLESS STEEL CONSTRUCTION**
  The heavy gauge housing is intended for rugged outdoor use. ERL Pressure Gauges have all stainless steel cases and safety glass lens. The bottom 1/4" or 1/2" NPT attachment fitting is instrument-quality brass.

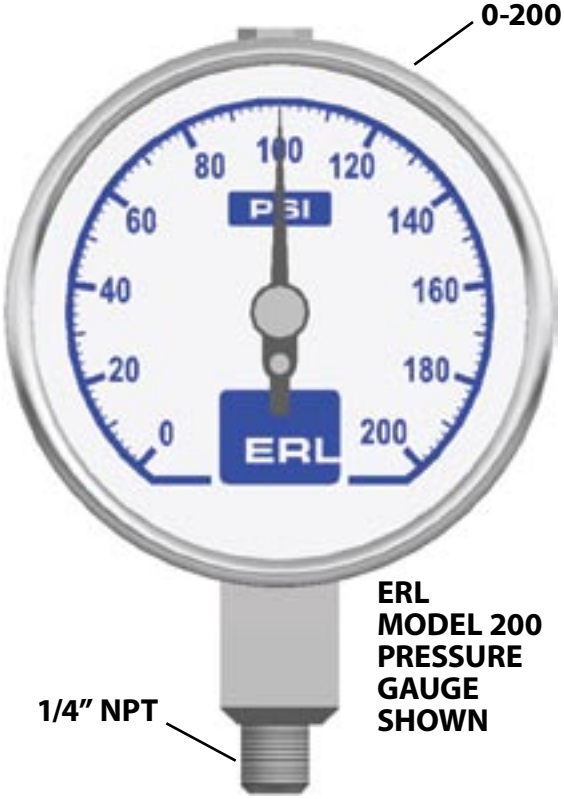
- **±0.5% ACCURACY**
  A large easy-to-read dial is calibrated to ±0.5% full scale accuracy. ERL can prepare a Certificate of Accuracy, should you require one, for a nominal fee. Re-certification, calibration and repair services are also available. For accuracy and proper operation, all Pressure Gauges must be mounted in the vertical position and the gasket under the vent cap must be removed to allow the gauge to breathe.

- **SILICON FILLED**
  The inside of the gauge is filled with pure silicon to dampen needle fluctuations and protect the precision internal mechanisms. Gauges can be provided dry upon request.

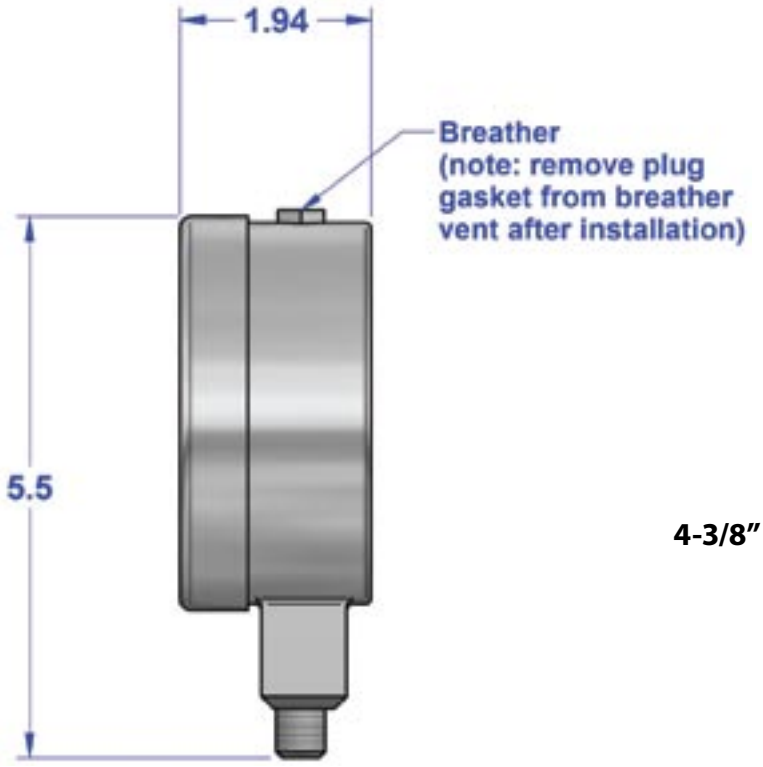
1/4" NPT

PRESSURE GAUGES
BOURDON TUBE TYPE

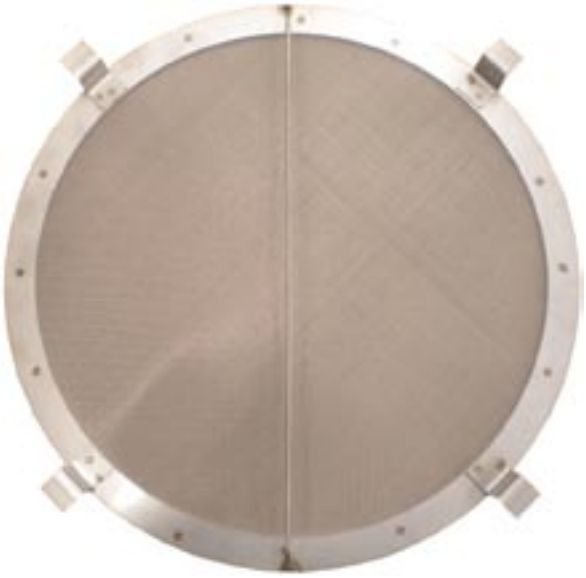
0-200 PSI Pressure Gauge



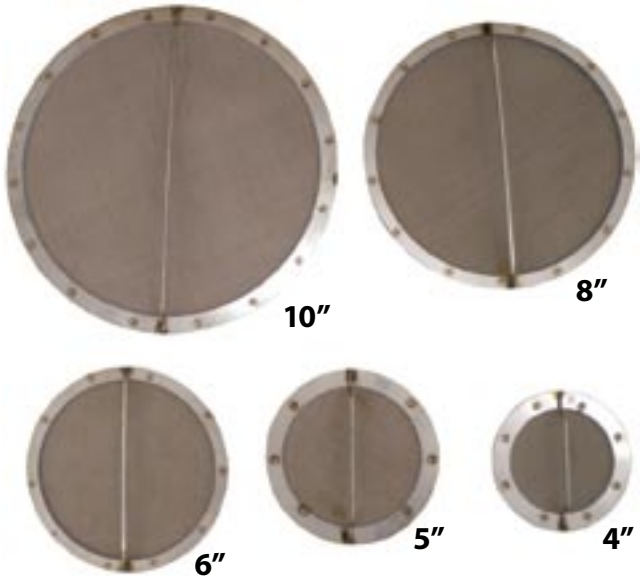
ERL MODEL 200 PRESSURE GAUGE SHOWN



MARINE FLAME SCREENS



12" FLAME SCREEN WITH CLIPS



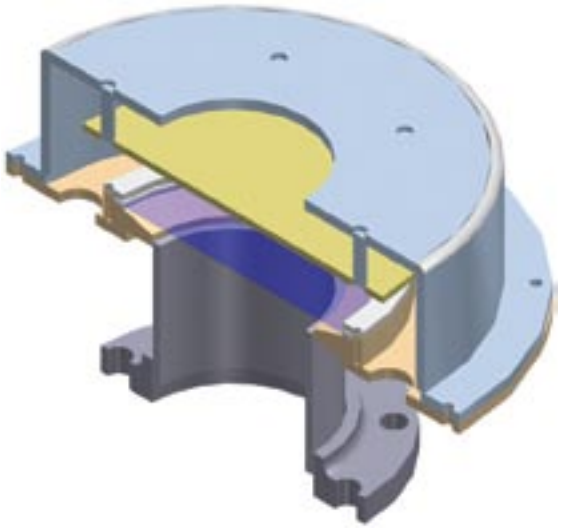
- **FULL COMPLIANCE WITH 46 CFR PART 151, PARA. 151.03-25**
  ERL Flame Screens are in full compliance with U.S. Coast Guard Regulations 46 CFR part 39, paragraph 39.20-3(a) and are suitable for use on ABS classed vessels. Our Flame Screens are made from 30 X 30 316SS mesh to provide the optimum resistance to flame propagation while still allowing the tank to breathe.

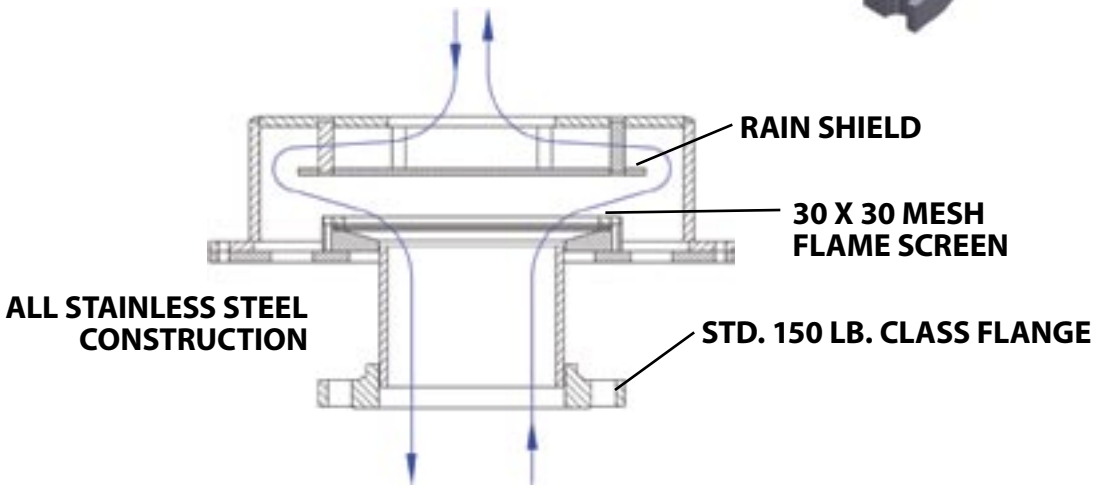
- **100% STAINLESS STEEL**
  The outer rings are cut by computer controlled lasers from stainless steel sheets, yielding Flame Screens of the correct O.D. that fit snugly in the ullage hatch bore as required. A stainless steel low profile handle is welded to each Flame Screen for ease in removal and handling. Our Flame Screens are spot-welded for strength.

- **FULL RANGE OF SIZES**
  ERL manufactures a full line of round and oval Flame Screens. When ordering, please specify the O.D. you require. In addition to Flame Screens, ERL can provide wire 30 X 30 316SS mesh in 36" wide rolls.

HATCH SCREEN

PROTECTED FLAME SCREEN VENT





- **100% STAINLESS STEEL CONSTRUCTION**
  All components of the ERL Protected Flame Screen Vent are 300 series stainless steel construction allowing for extended service life and a reduced need for maintenance.

- **OPERATIONS**
  The ERL Protected Flame Screen vent contains and internal flame screen made from 30 X 30 316SS mesh to provide optimum resistance to flame propagation while still allowing the tank to breathe. The Protected Flame Screen Vent comes with a 150# Class Flange which allows for easy mounting to pipe stand.

- **FULL RANGE OF SIZES**
  ERL offers a full range of sizes for the Protected Flame Screen Vent from 4" to 16". When ordering, please specify which size you desire.

VENT STACK

Top section of Vent Stack containing Flame Screen

- **FULL REGULATORY COMPLIANCE**
  ERL Vent Stacks satisfies the requirements of 46 CFR Subpart 32.55 – Ventilation and Venting and includes a 30 X30 316SS mesh Flame Screen which complies with U.S. Coast Guard Regulations 46 CFR part 39, Paragraph 39.20-3 (a).

- **100% STAINLESS STEEL**
  All ERL Vent Stacks are constructed from 304 Sch 10 stainless steel ensuring extended service life and a reduced need for maintenance. The top of the Vent Stack contains 30 X 30 316SS Mesh allowing for optimum resistance to flame propagation.

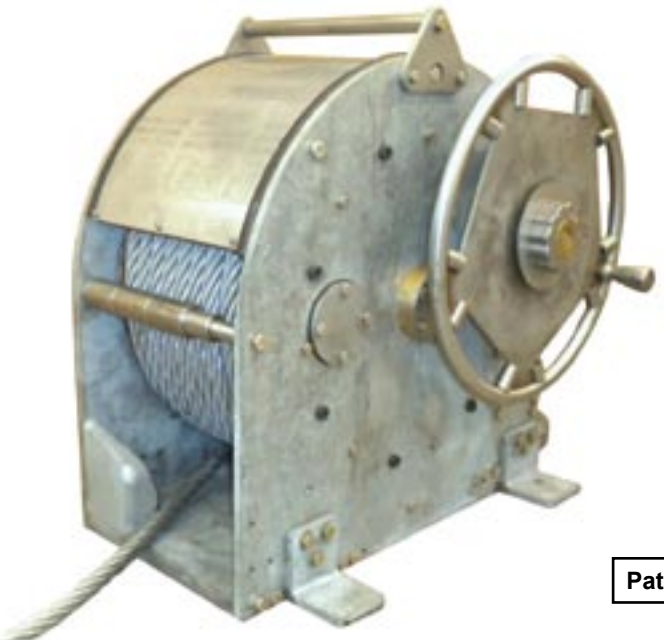
- **MAINTENANCE AND OPTIONS**
  Since the ERL Vent Stacks are constructed from 300 series stainless steel it reduces the need for maintenance and the top section of the Vent Stack is easily disassembled for complete inspection of the internal flame screen. ERL offers swivel or ridged mount and the body can be produced from either 8" or 10" 304 sch 10 stainless steel.

ERL Vent Stack Collapsible - mounted on swivel flange.

SECTION 04

BARGE CONNECTION

BARGE CONNECTION



Patent Pending

- **EASIER TENSIONING**
  The ERL 40 Ton Barge connecting winch allows the user to tighten or release the load by simply turning the hand wheel. The winch will tighten the 1" steel cable to 18,000lbs without the use of a cheater bar

- **EASIER RELEASING**
  Our winch is designed to release the load slowly. In addition the drum has a single layer of wire. This prevents the tangling of wire known as "birdnesting".

- **SAFER OPERATION**
  The user is always in control of the speed of the winch. This allows for the safe release of up to 40 tons. The winch does not have dogs that hold or release the load.

- **TWO SPEED DESIGN**
  One speed for fast take-up and cable pullout. A second speed for cable tension and load release. This allows the user to tie barges efficiently as well as easily tightening the cable to 18,000 lbs.

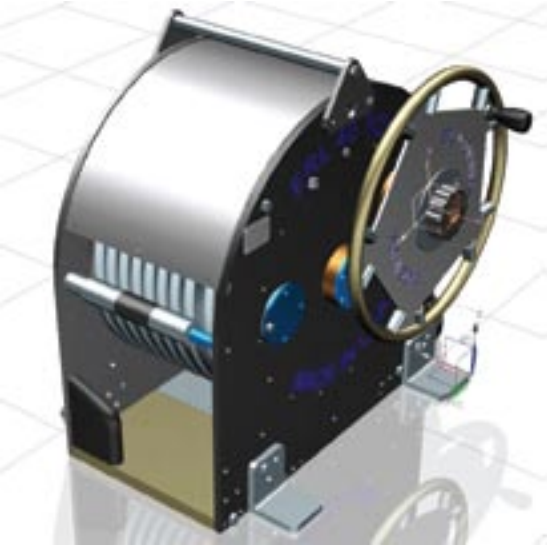
- **LIFE CYCLE TESTING**
  The ERL 40 ton winch has completed over 1,000 cycles or 10 years of service, cable tensioned from zero to 18,000 lbs.

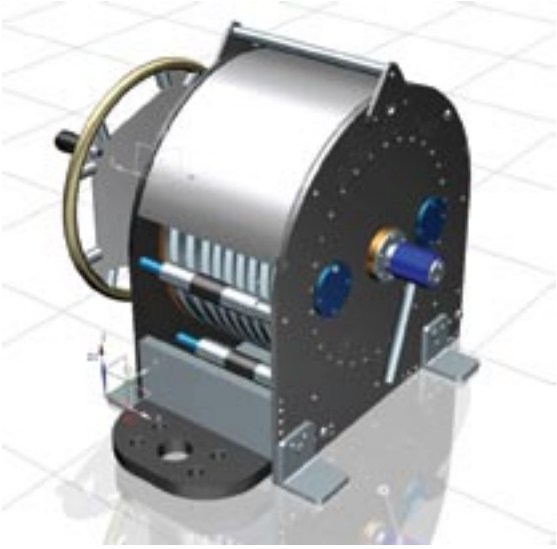
DESCRIPTION OF THE 40 TON WINCH

The ERL 40 ton winch is the first of its kind. It is truly a revolutionary device for barge connection. It is the first winch designed for barges that allows the user to always be in control of the cable. This winch is designed for safe tensioning and releasing of cable. The ERL 40 ton winch has two ratios. The high ratio allows the user to apply up to 18,000 lbs of load to the cable. This ratio also allows the user to release up to 40 tons at the rate the user desires. This ratio is selected by simply lowering the lever located on the opposite side of the hand wheel. To apply load to the cable the user simply turns the hand wheel towards the back of the winch. To release the load the user simply turns the hand wheels towards the front of the winch. This winch does not use dogs to release the load instantaneously. The load is released at the rate the user desires by turning the hand wheel.

The low ratio allows the user to pull out cable easily and take up cable quickly. This ratio does not allow the user to apply load to the cable. The low ratio is selected by raising the lever located on the opposite side of the hand wheel. To take up cable the user simply turns the hand wheel towards the rear of the winch. The winch holds 50 feet of cable on 1 layer to prevent tangling of wire known as "birdnesting".

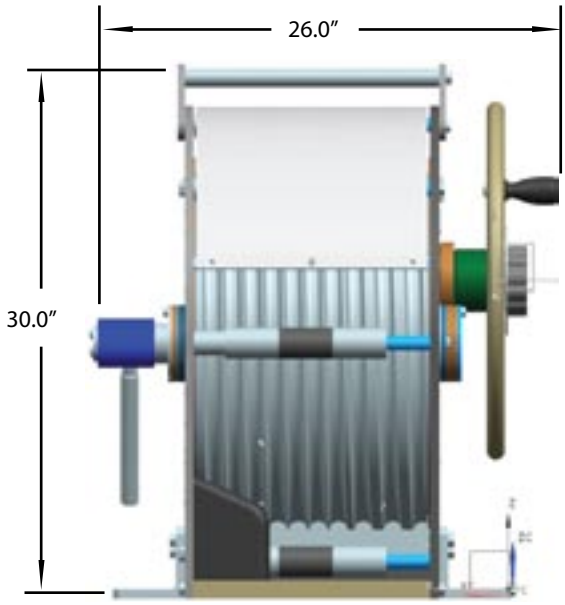
KEY DESIGN FEATURES

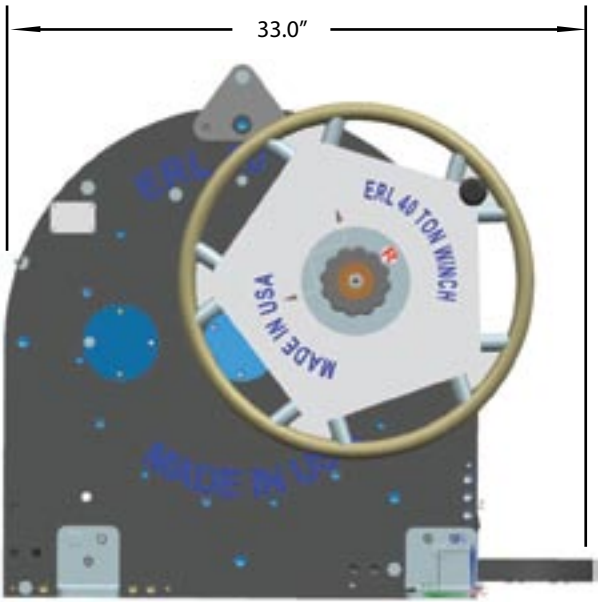




- LOW WEIGHT: 900LBS
- SIMPLE LEVER TO CHANGE SPEEDS
- GEARS ARE SELF CONTAINED AND PERMANENTLY LUBRICATED
- NO GREASE FITTINGS TO MAINTAIN
- TRUE 40 TON CAPACITY WITHOUT YIELDING TEETH
- NO EXPOSED GEARING
- DRUM CAPACITY OF 50 FEET
- ALL EXTERNAL PARTS ARE STAINLESS STEEL, BRONZE, OR GALV PLATE
- MANUFACTURED AND ASSEMBLED IN THE USA
- MULTIPLE PATENTS PENDING

OVERALL DIMENSIONS





MATERIALS USED

- **STAINLESS STEEL HANDWHEEL ASSEMBLY**
- **BRONZE MAIN BEARINGS**
- **GALVANIZED STEEL FRAME**
- **STAINLESS STEEL GEAR LEVER ASSEMBLY**
- **STAINLESS STEEL CABLE ROLLERS**

40 TON WINCH OPERATING INSTUCTIONS
TIGHTEN CABLE INSTRUCTIONS:

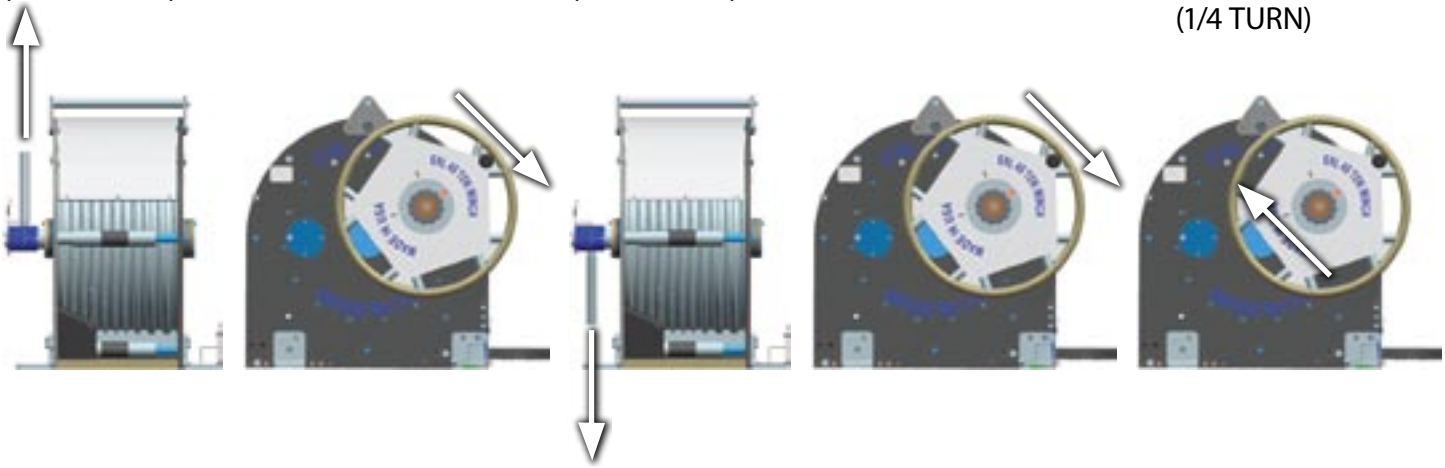
ROTATE LEVER UP (HIGH SPEED)

TAKE UP SLACK (HIGH SPEED)

ROTATE LEVER DOWN (LOW SPEED)

TIGHTEN WIRE (LOW SPEED)

ENGAGE HANDWHEEL LOCK (1/4 TURN)



RELEASING CABLE INSTRUCTIONS:

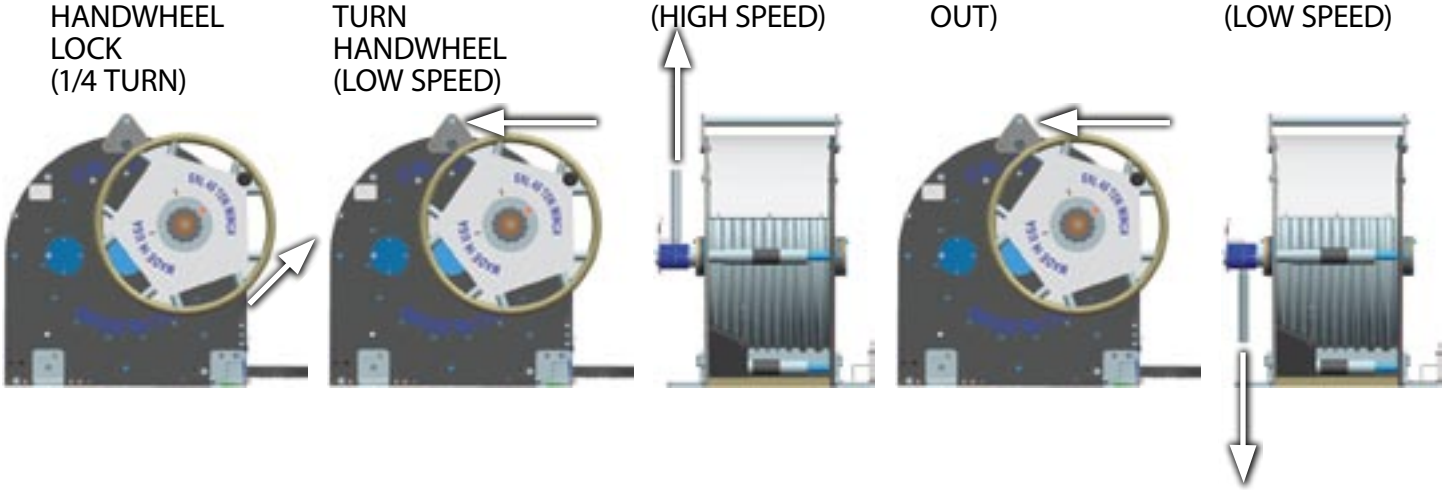
RELEASE CENTER HANDWHEEL LOCK (1/4 TURN)

LET OFF TENSION TURN HANDWHEEL (LOW SPEED)

ROTATE LEVER UP (HIGH SPEED)

LET SLACK OUT (WIRE PULL OUT)

ROTATE LEVER DOWN (LOW SPEED)



NOTES:

To reel in wire, Turn handwheel toward the rear of the winch.

To release wire, Turn handwheel toward the front of the winch.

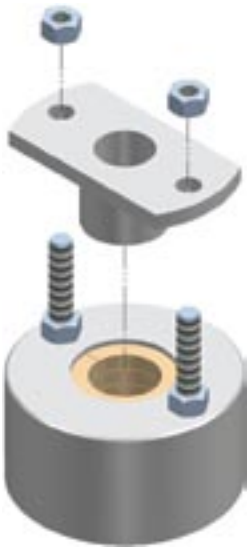
Lever Must Be Up to Pullout Wire

Lever Must Be Down to Hold Tension

Do not apply Tension unless at least Two Complete wraps of rope are on the drum.

SECTION 05 MARINE PRODUCTS

SUPERSEAL™ REACH ROD STUFFING BOX



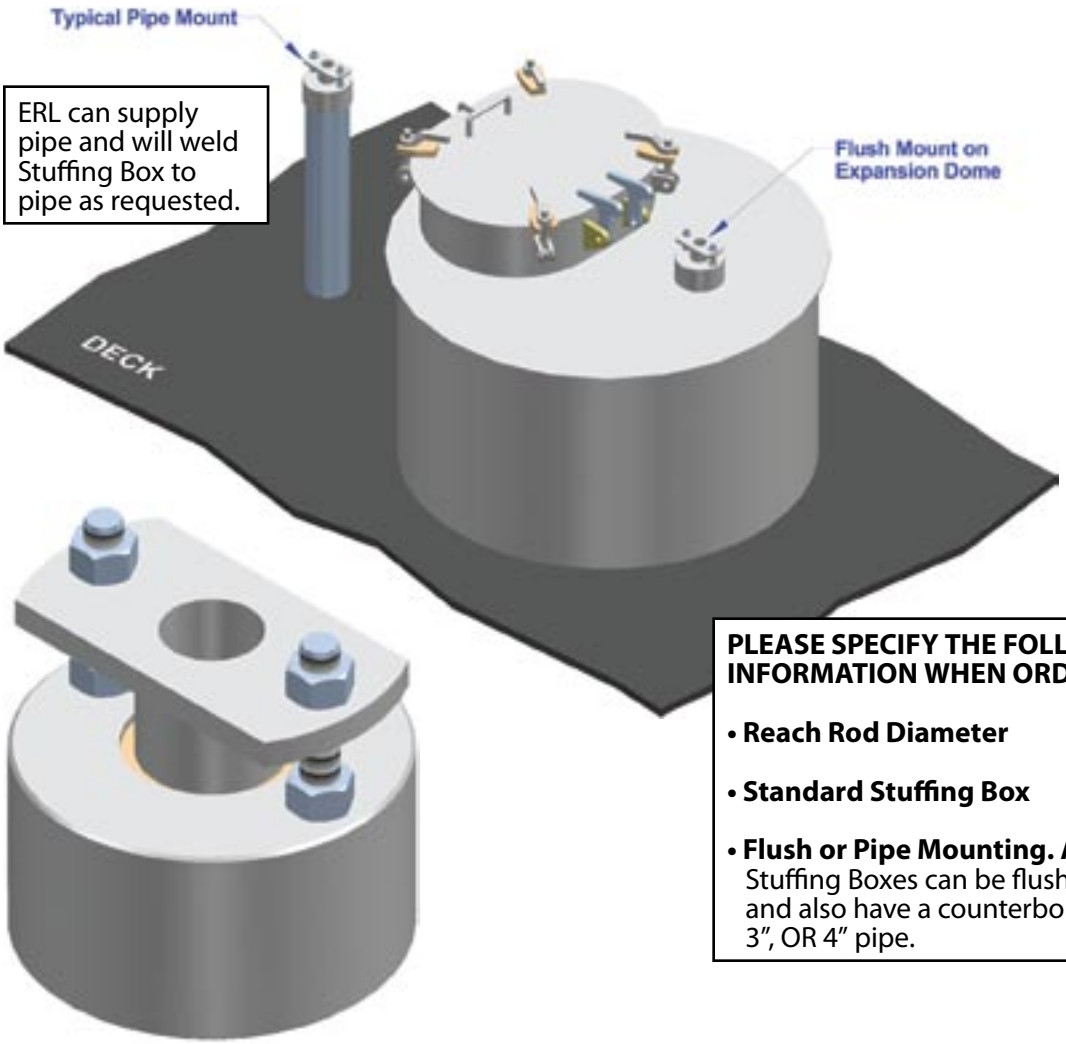
- **100% STAINLESS STEEL CONSTRUCTION**
  ERL's SUPER SEAL™ Reach Rod Stuffing Box is completely constructed of 300 series stainless steel. Produced on computer controlled machines to accurately control dimensional quality, the body of the stuffing box is a massive 5" diameter to prevent deformation of the bore from the heat of welding during installation.

- **VAPOR TIGHT PERFORMANCE**
  Die cut Teflon™ Packing Rings are designed to fit perfectly in each size Stuffing Box forming an effective vapor tight seal preventing fugitive emissions. The "T" shaped gland draws downward to lightly compress the Teflon™ packing. two Teflon™ coated Steel nuts maintain the glands compression setting on the packing. A grease fitting on the gland allows the introduction of grease between the reach rod and the bore of the gland. Grease lubrication lubricates while further reducing fugitive emissions. For best long term performance the reach rod should be stainless steel. In any case the reach rods surface must be smooth.

- **EASY INSTALLATION**
  ERL stocks the most popular size stuffing boxes, as listed below, other sizes are produced as requested. Standard Stuffing Boxes can be flush mounted, a counterbore also permits mounting on a 2.5" ,3", or 4" pipe. Other size counterbores, including threaded counterbores, are produced as requested.

- **AVAILABLE VALVE POSITION INDICATOR**
  All size Stuffing Boxes are designed to easily accommodate the ERL Valve Position Indicator. Save time and money by installing the Valve Position Indicator and Stuffing Box at the same time. Additionally ERL can provide Handwheels, Stem Adapters, Reach Rods, Couplings and Yokes.

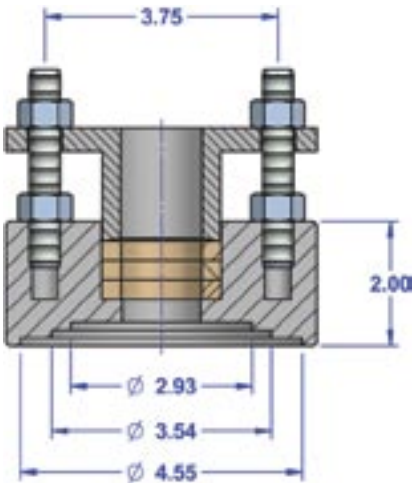
SUPERSEAL™ REACH ROD STUFFING BOX

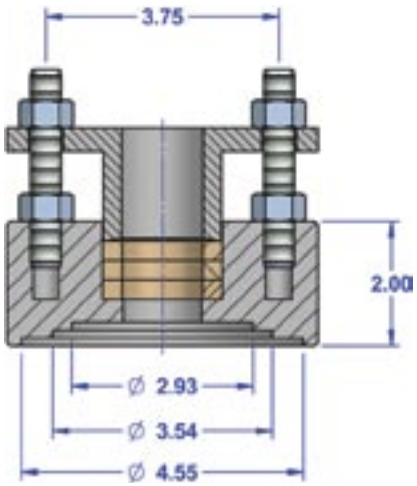


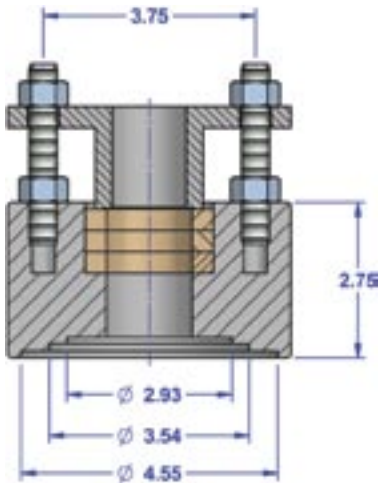
ERL can supply pipe and will weld Stuffing Box to pipe as requested.

PLEASE SPECIFY THE FOLLOWING INFORMATION WHEN ORDERING -

- **Reach Rod Diameter**
- **Standard Stuffing Box**
- **Flush or Pipe Mounting. All ERL** Stuffing Boxes can be flush mounted and also have a counterbore for a 2.5", 3", OR 4" pipe.







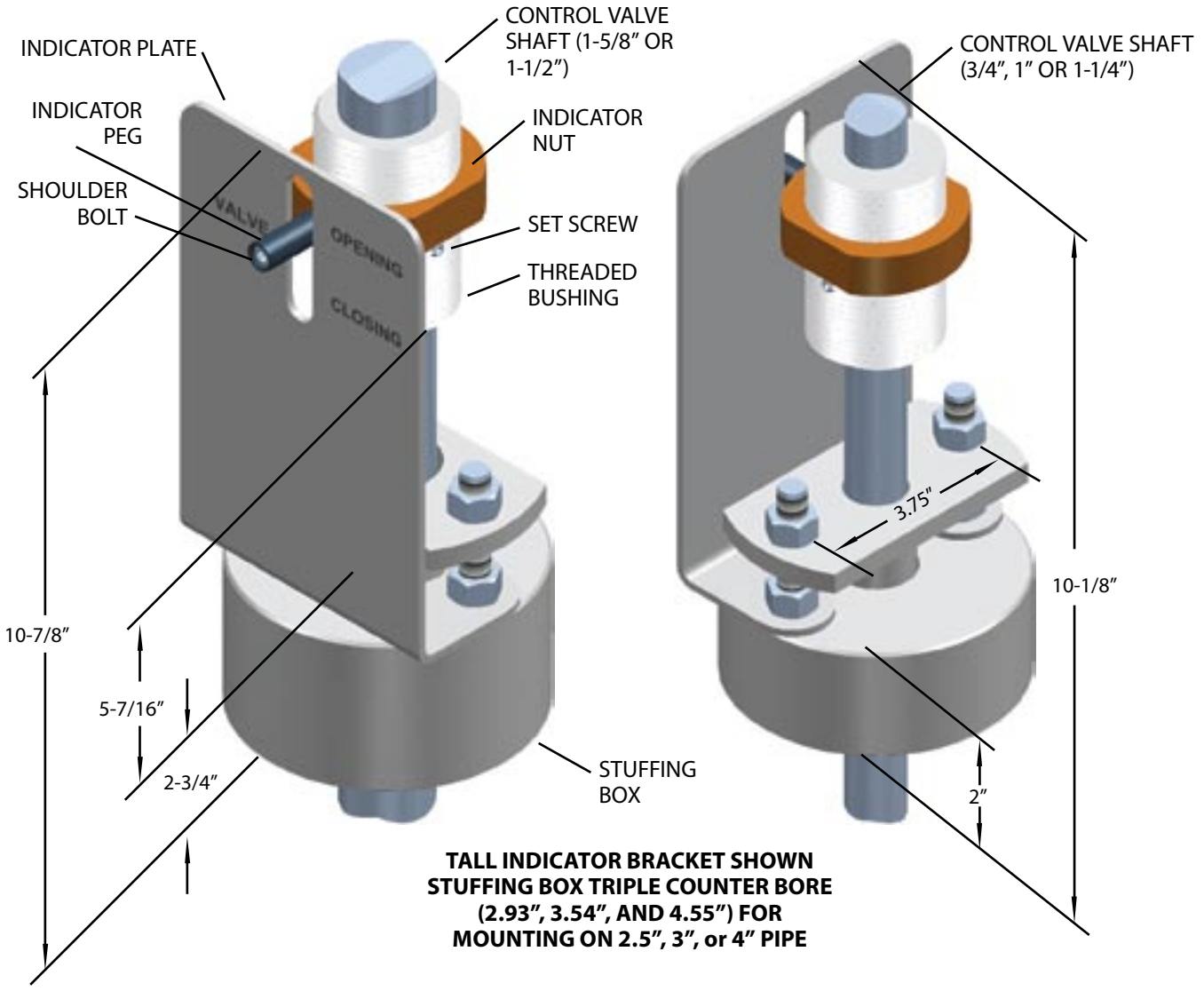
CARGO VALVE POSITION INDICATOR

- **REGULATORY COMPLIANCE**
  ERL's valve position indicator satisfies 46 CFR 56.20-9(a), which requires an indicating device on non-rising stem valves. Not only does our Cargo Valve Position Indicator satisfy a legal requirement, it can help you to prevent costly damage to equipment and possible overfill cargo spills.

- **QUALITY HEAVY DUTY CONSTRUCTION**
  Manufactured entirely from 300 series stainless steel and solid brass on computer controlled machines, ERL's simple valve position indicator design will give you many years of trouble-free service.

- **INSTALLATION FLEXABILITY**
  ERL manufactures a variety of indicator brackets allowing you to have off the shelf custom fit with non ERL stuffing boxes. Our custom stock brackets can fit a a stud distance from 3.75" to 5.5" or 2.5" diameter round stuffing box's.

CARGO VALVE POSITION INDICATOR



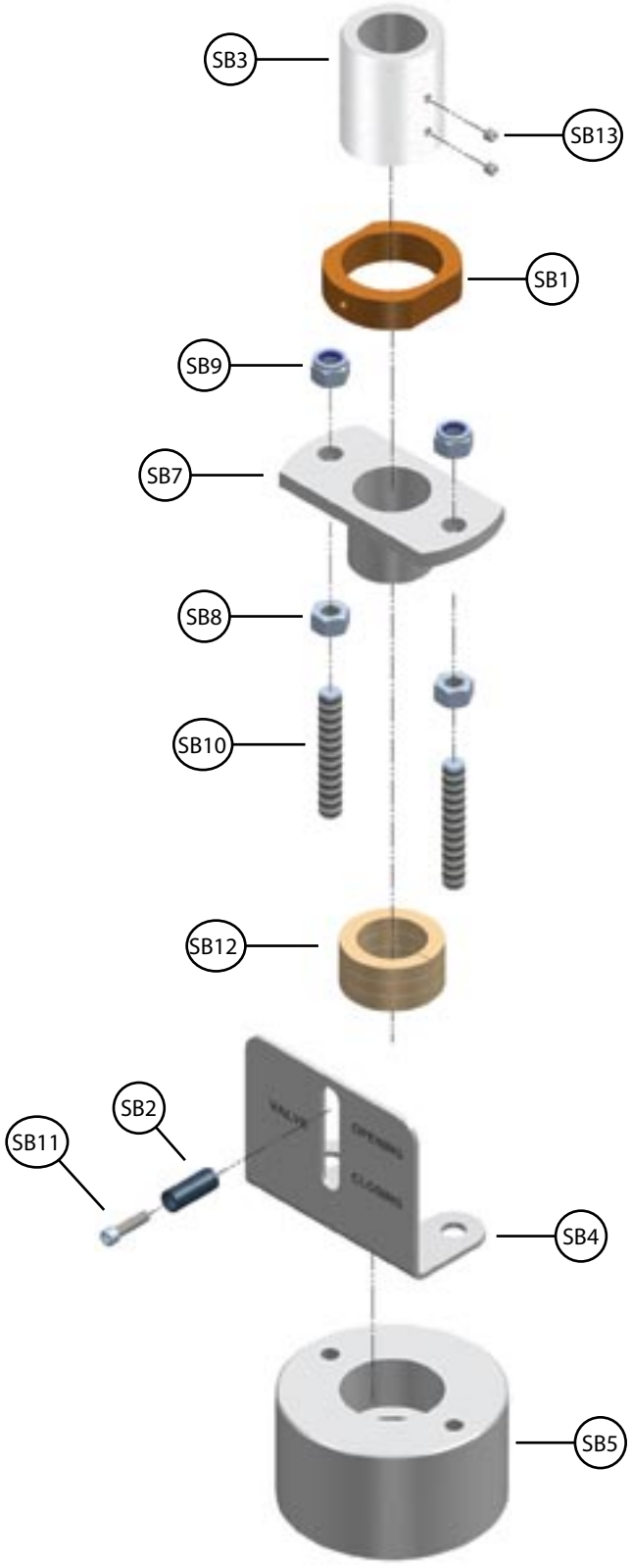
TALL INDICATOR BRACKET SHOWN
STUFFING BOX TRIPLE COUNTER BORE (2.93", 3.54", AND 4.55") FOR MOUNTING ON 2.5", 3", or 4" PIPE

When ordering ERL's valve position indicator, simply specify:
- The reach rod diameter.
- The number of turns full open to full closed on the cargo valve.
- Short or tall indicator plate.
- For use with superseal stuffing box or other.

- **EASY INSTALLATION**

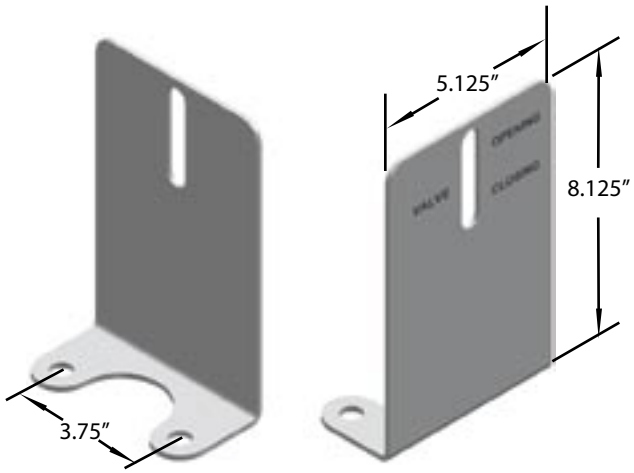
Our threaded stainless steel Valve Position Indicator bushing, item #3, is designed to easily fit the reach rod, while the indicator plate bolts to the Superseal Stuffing Box. A special indicator bracket with slotted mounting holes may need to be provided to fit non-ERL stuffing boxes. We offer two standard indicator plates, one short and one tall. The short indicator plate is for retrofit installations when there is little distance between the hand wheel and the stuffing box. The tall indicator plate is recommended on all installations if vertical space allows, as the tall indicator plate allows complete access to the stuffing box packing.

SUPERSEAL™ STUFFING BOX/VALVE POSITION INDICATOR ASSEMBLY DRAWING

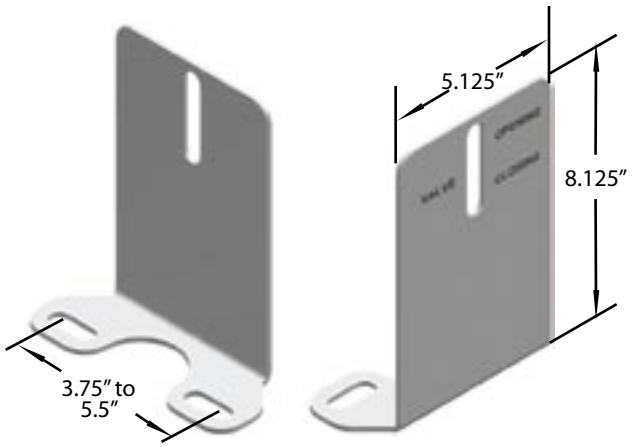


Item	Part Name	Qty.
SB1	Indicator Nut	1
SB2	Indicator Peg	1
SB3	Threaded Bushing	1
SB4	Indicator Plate (Short or Tall)	1
SB5	Stuffing Box	1
SB7	Gland	1
SB8	Hex Nut, stainless	2
SB9	Hex Nut, teflon coated	2
SB10	Stud	2
SB11	S.H.C.S.	1
SB12	Packing Stuffing box size: 3/4" 1" 1-1/4" 1-1/2" 1-5/8" Thickness of packing: 5/16" 5/32" 5/16" 3/8" 5/16" Number of Rings: 3 5 3 2 3	
SB13	SETSCREWS	2

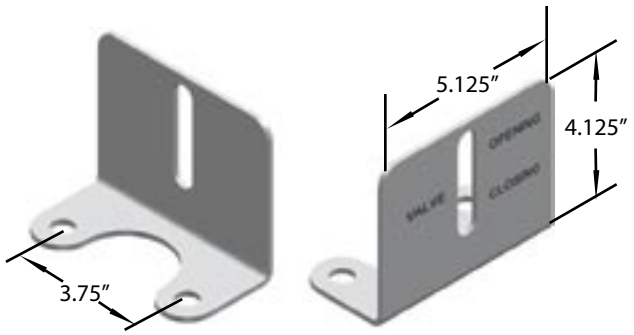
CARGO VALVE POSITION INDICATOR PLATES
304 STAINLESS STEEL



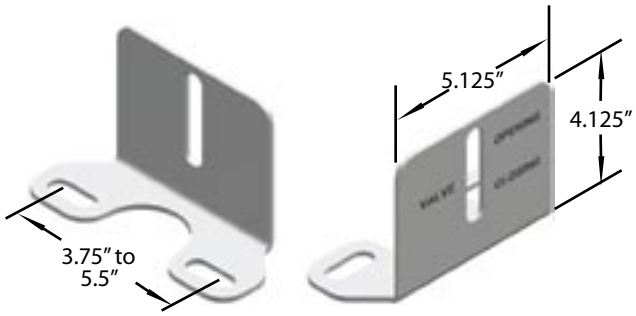
STANDARD TALL INDICATOR PLATE



SPECIAL TALL INDICATOR PLATE

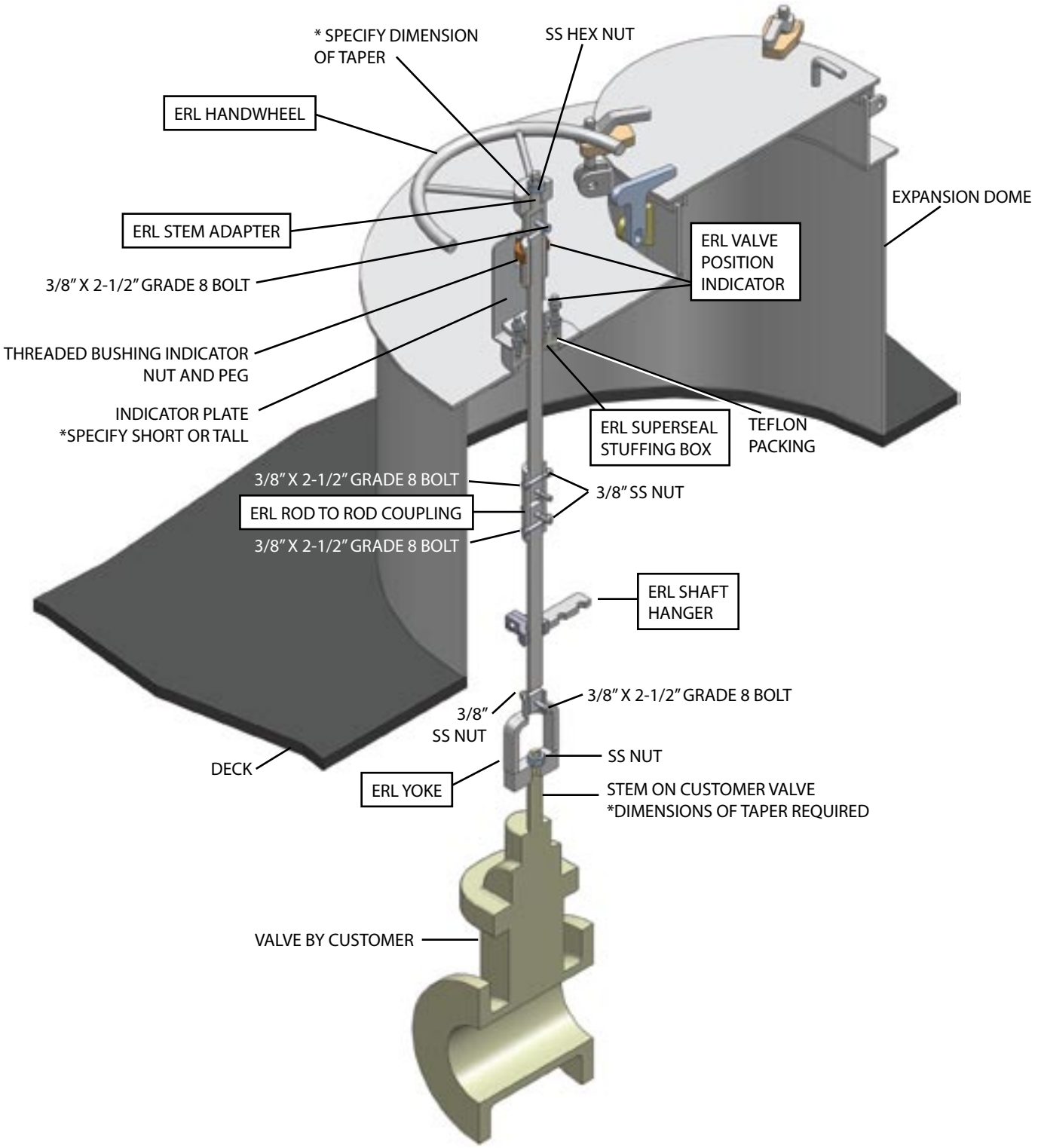


STANDARD SHORT INDICATOR PLATE



SPECIAL SHORT INDICATOR PLATE

ERL's CONTROL VALVE OPERATING SYSTEM



REACH RODS•STEM ADAPTERS•HANDWHEELS• •COUPLINGS•YOKES•

- **REACH RODS**
  ERL Reach Rods are all 300 series, corrosion resistant, 100% stainless steel for extended service life. Full length Reach Rods can be provided as well as 2 part Reach Rods with coupling. One end can be machined to fit the Handwheel, but in many cases a Stem Adapter reduces the installed cost of the reach assembly. Brass,Stainless Steel, or Mild Steel shaft hangers are available for long reach rods.

- **STEM ADAPTERS**
  Machined on computer controlled equipment from solid 300 series stainless steel bar stock, ERL's Stem Adapters represent the most simple economical way to ensure a perfect Handwheel to reach rod fit. ERL's Class III threads, matched stainless steel nut and heavy flat washer secure the steel nut and the heavy flat washer secure the Handwheel safely, yet allow it to easily be removed without applying heat and force. For ultimate flexibility the Stem Adapter can be either bolted or welded to unmachined stainless steel bar stock.

- **HANDWHEELS**
  Available in a variety of popular diameters, ERL's heavy duty Handwheels all have stainless steel hubs, and five stainless steel spokes (each 3/4" diameter) connect the hub to the solid 1" diameter rolled stainless steel outer ring. The corrosion resistant hub insures long life and easy removal from the Reach Rod.

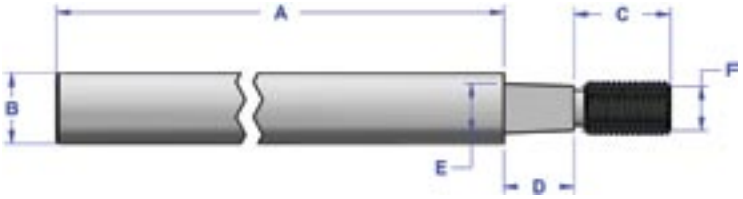
- **COUPLERS**
  ERL machines stainless steel rod-to-rod Couplings from solid bar stock to insure a perfect fit to your reach rod O.D. 6" long Couplings are drilled to accommodate the bolting together of two solid rods. The Coupling can be welded on one or both ends if desired. A two part Reach Rod with a bolted Coupling is easy to install and facilitates future service of the Reach Rod.

- **YOKES**
  ERL's stainless steel rod-to-valve Yoke, represents the most simple, economical way to connect the lower end of the Reach Rod to the liquid control valve. Bolted or welded to the lower end of the Reach Rod the bottom of the Yoke bolts to the valve stem.

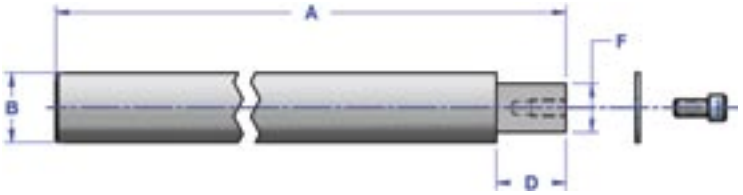
REACH RODS

Reach Rod with integral square STRAIGHT shank and threaded for specified Handwheel.

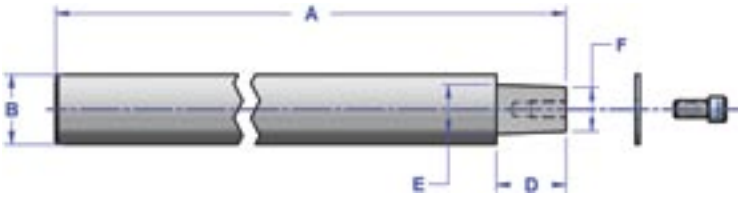
Reach Rod with integral square TAPER shank and threaded for specified Handwheel.



Reach Rod with integral square STRAIGHT shank Handwheel drilled and tapped for mounting bolt.



Reach Rod with integral square TAPER shank Handwheel drilled and tapped for mounting bolt.

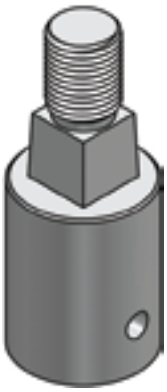


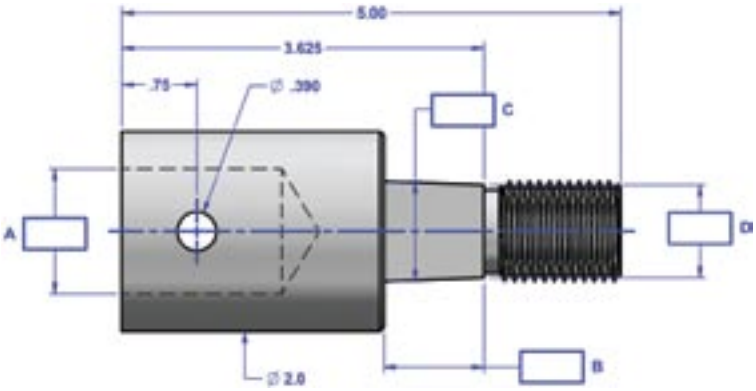
ERL Reach Rods are all manufactured from 300 series, corrosion resistant, stainless steel for extended service life under all conditions. Full length Reach Rods can be provided, as well as, the easier to install, coupled upper and lower Reach Rods. The Handwheel adapter can be machined integral to the Reach Rod or you can use one of ERL's Stem Adapters if you are looking for the ultimate in installation flexibility. Refer to the drawings above and the Ordering Information Table below when ordering. Take care to preserve the reach rods smooth finish in way of the stuffing box.

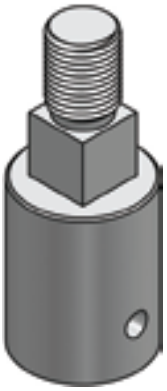
ORDERING INFORMATION TABLE

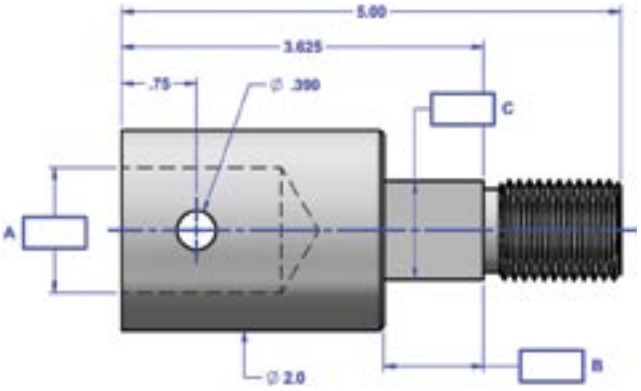
Reach Rod Style	**A** Length	**B** Diameter	**C** Thread Length	**D** Flat Length	Flat Dimension **E** Big End	Flat Dimension **F** Small End
Square					n/a	
Taper						
Round			n/a	n/a	n/a	n/a

STEM ADAPTERS





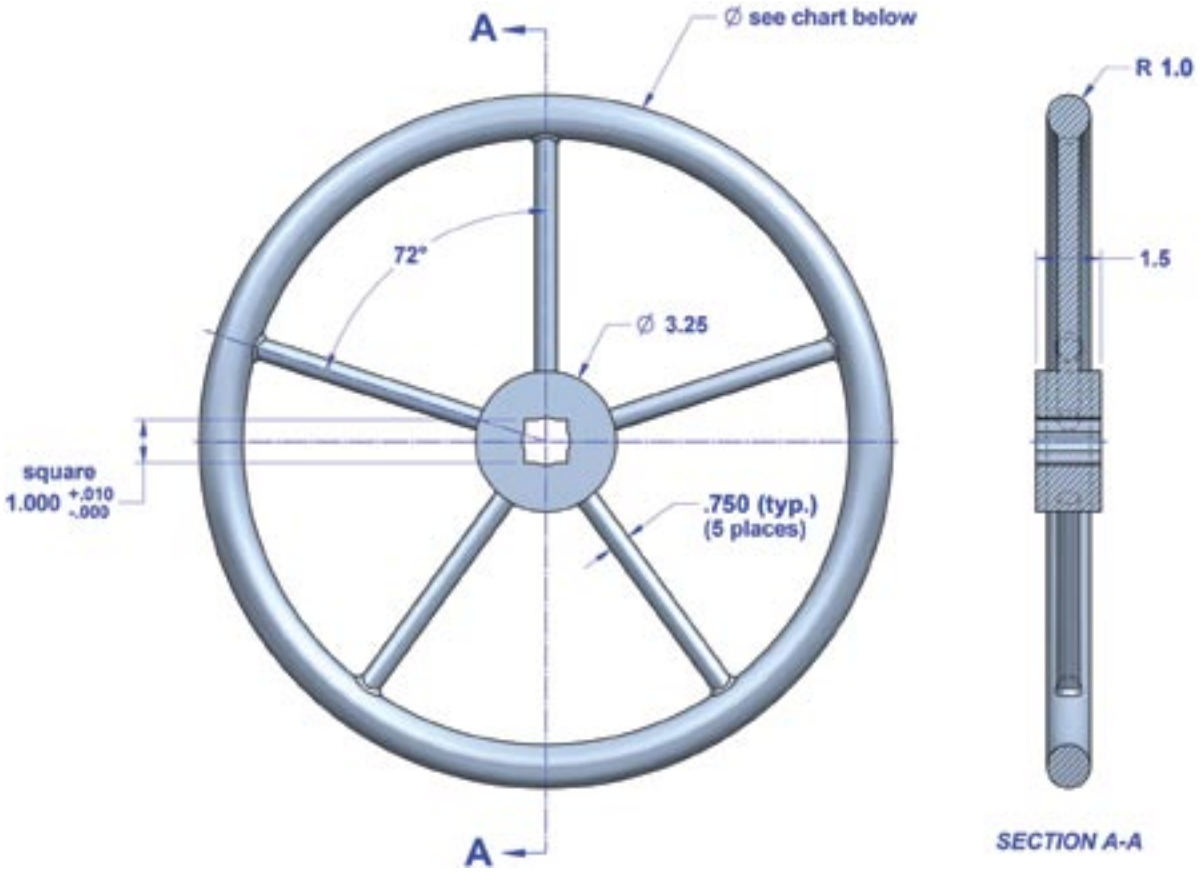




ERL stainless steel Stem Adapters are easy to use and they save you money. Class III threads and CNC machining quality insure both good fit and the ability to easily remove the handwheel without heat or destructive force. Simply weld or bolt the Stem Adapter, which has been machined to perfectly fit your handwheel, to an un-machined stainless steel bar stock for a perfect economical reach rod everytime!

ORDERING INFORMATION TABLE
Reach rod diameter: A
Machined flats lengths: B Required to fit your handwheel.
Square or Taper dimensions: Big End: C
Taper dimension: Small End: D
Simply verify the dimensions on the above drawings and provide the dimension represented by the blanks above to expedite accurate completion of your order.

HEAVY DUTY HANDWHEELS

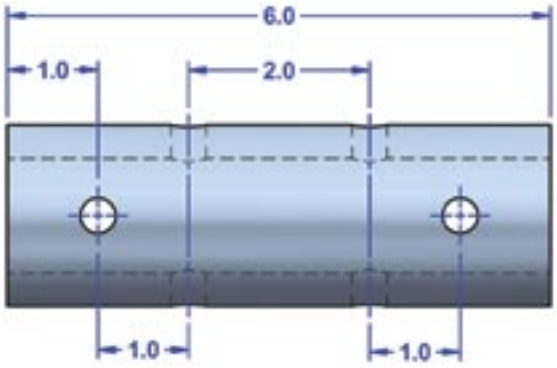


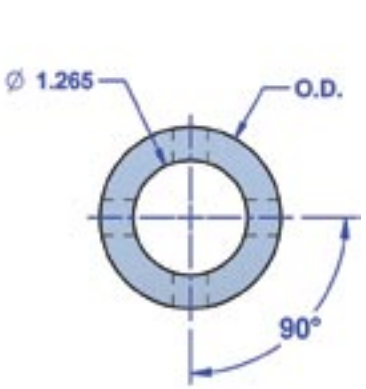
ERL's Heavy Duty Handwheels feature a stainless steel hub and spokes surrounded by a solid 1" diameter rolled 300 Series Stainless Steel ring. ERL's standard hub has a 1" square broached hole that is a full 1-1/2" thick for extra strength.

Standard Sizes

ERL Part No.#	Diameter
HW-1-12	12" Diameter
HW-1-14	14" Diameter
HW-1 - 16	16" Diameter
HW-1 - 18	18" Diameter
HW-1 - 20	20" Diameter

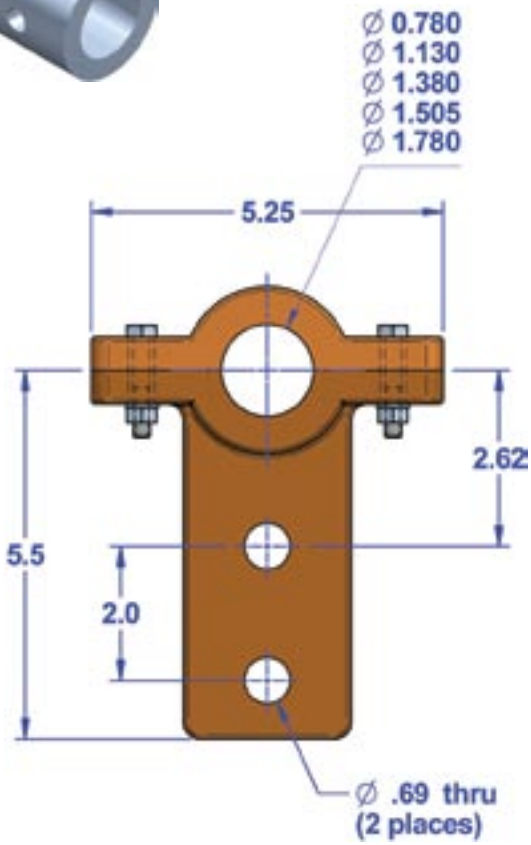
ROD-TO-ROD COUPLERS / SHAFT HANGERS





- ERL Rod-to-Rod Couplings are machined from solid stainless steel bar stock (series 300) to ensure a smooth fit with the Reach Rod's outside diameter. Standard Couplings are 6" long and are drilled in four places to accept .375" dia. Grade 8 bolts. The Reach Rod is matched drilled at assembly to the Coupling's bolt pattern. ERL can offer a solid style Coupling that can also be welded to the Reach Rod on either or both ends, if desired.

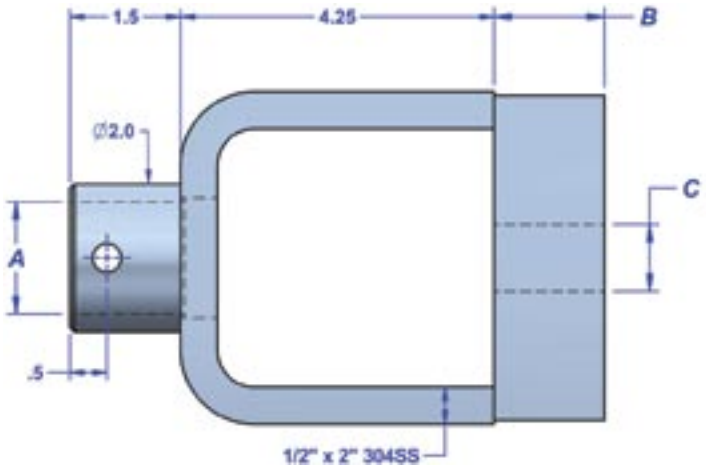
- ERL Cast Brass or Stainless Steel Shaft Hangers provide support to long reach rods. Simply specify reach rod diameter when ordering.

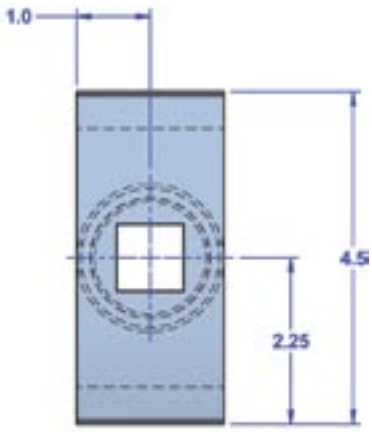


ORDERING INFORMATION TABLE

Reach Rod Diameter	3/4"	1 "	1-1/4"	1-1/2"	1-5/8"
Coupling Part No.#	C-1	C-2	C-3	C-4	C-5
Hanger Part No.#	H-1	H-2	H-3	H-4	H-5

YOKES
STRAIGHT SQUARE





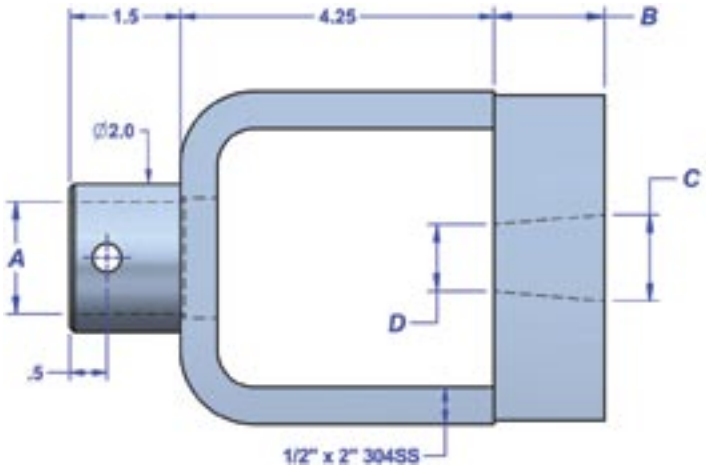
ORDERING INFORMATION TABLE
ROD DIAMETER: A =
DEPTH: B =
SQUARE DIMENSION: C =

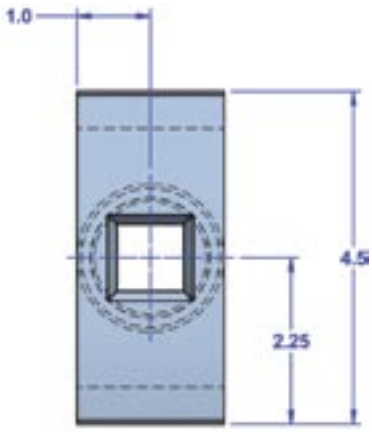
- **EASY INSTALLATION**
  Machined to easily fit your Reach Rod and Cargo Valve stem. When ordering, provide the Reach Rod diameter and the Valve Stem mounting dimensions as called out with the letters "A", "B" and "C" in the above drawing.

- **HEAVY DUTY CONSTRUCTION**
  ERL Yokes are manufactured from heavy 300 series, corrosion resistant stainless steel for totally trouble-free service.

ORDERING INFORMATION TABLE - Straight Square Yokes (YS)					
Coupling Inside Diameter	3/4"	1"	1-1/4"	1-1/2"	1-5/8"
ERL Part No.#	YS-1	YS-2	YS-3	YS-4	YS-5

YOKES
TAPERED SQUARE





ERL's heavy stainless steel rod-to-valve connection yoke is the easiest and most economical way to connect the lower end of the Reach Rod to the Cargo Control Valve. ERL machines, from the dimensions you supply, the lower end of the Yoke to match your Cargo Control Valve stem. The upper end of the Yoke is also machined and is designed to be either welded or bolted to the lower end of the Reach Rod.

ERL Square TaperYokes are available in the following sizes to fit the lower end of standard ERL Reach Rods.

YOKE P/N	Dia. Reach Rod **A**	Taper Depth **B**	Bottom Square **C**	Top Square **D**
YT-1	0.75"			
YT-2	1.0"			
YT-3	1.25"			
YT-4	1.50"			
YT-5	1.625"			

Specify the drawing call-out dimensions "B", "C" & "D" above for proper fit of the lower end of the Yoke to the Cargo Valve Stem.

REGULATORY SIGNS

Emergency Shutdown sign and Frame mounted next to Warning Dangerous Cargo Sign and Frame.

Emergency Shutdown Sign and Frame mounted next to main vapor line.

Warning Dangerous Cargo Sign with Frame containing CGS sign on top CIC sign and NOT sign on side mounted next to Danger – Benzene Sign with Frame.

REGULATORY SIGN PROGRAM FOR TANK BARGES

DANGEROUS CARGO SIGN

Standard Model DCA-001 shown here with required Cargo Sign, Cargo Information Card and Emergency Notification Signs. While these three smaller signs are USCG required, they are not included with the DCA-001 so that you may order the exact cargo signs you need separately. The basic DCA- 001 includes the mounting platforms for these signs.

- **ALL SIGNS MEET OR EXCEED USCG REGULATIONS**
  We have carefully studied all of the applicable USCG regulations so that you won't have to worry about whether or not your signs meet the specs. Your barge is not going to be "grounded" because of an incorrect or missing sign.

- **TOP QUALITY MATERIALS AND CONSTRUCTION**
  ERL regulatory signs are designed for the harsh working environment encountered by barges year after year and season after season. Frames are made from 300 series stainless steel, signs are aluminum and mounting hardware is stainless steel. The best exterior rated finishes are used and all components are completely finished before assembly.

- **YOUR MOST COST EFFECTIVE WAY TO COMPLY WITH USCG REGULATIONS**
  ERL signs are your best value because we manufacture our signs in quantities sufficient to keep production costs low and quality high.

- **STANDARDIZED SIGNAGE SYSTEM**
  Standardized sizes for frames and signs means savings to you years from now when you have to replace damaged or obsolete signs. Replacing or changing signs is quick, easy and hassle free. Expensive "field-fitting" is a thing of the past.

- **THE LARGEST INVENTORY IN THE INDUSTRY**
  We have the signs you need in stock ready for shipment. All signs are UPS shippable and can be express shipped, in most instances, the same day you order.

DCA-001 & BNZ-001

DCA-001 and BNZ-001 signs are built to last with all the features you want in one ready to install unit. Each unit features an easily collapsible, low-profile stainless steel design. Includes: 2 sided 29" x 42" "Warning - Dangerous Cargo" (black lettering on white background) sign, bright red pennant with lantern hook and bolt-on platforms for auxiliary signs. NOTE: CHRIS code signs (CCS-xxx), Cargo Signs (CGS-xxx) and Emergency Notification Sign (NOT-001) are not included and must be ordered separately. Mounting feet are designed to bolt-down or weld-down and can be installed to allow sign to lay down to port or to starboard. Assembly booklet/parts list is included. These signs are UPS shippable and the sturdy packaging means that you can keep extra units in inventory for emergencies without fear of damage.

- **Simple design allows sign to be laid down in seconds and without tools.**
- **100% Stainless Steel Hardware.**
- **Lantern hook is built on to pennant pole.**
- **Easy assembly.**
- **Tough polyester powder coated finish.**
- **Weld-down or bolt-down mounting feet.**

RED PENNANT AND POLE

Red Pennant with tough red polyester powder coated finish (both sides). Includes pre-drilled mounting holes in the pole, lantern hook and stainless steel mounting hardware.

CARGO VALVE LOCATION SIGNS

Although these signs are only 4" x 6", they can be read from more than 40 feet away. Standard signs are available in three series for cargo valves 1 thru 8 (Part numbers CRV-001 thru CRV-008), 1P thru 4P for port side cargo valves (Part numbers CRV- 01P thru CRV-04P) and 1S thru 4S for starboard side cargo valves (CRV-01S thru CRV-04S). All signs have a one sided imprint with black letters on a yellow background and are pre-drilled with four 1/4" holes for easy mounting.

BARGE CONNECTOR SIGN BCS-001

The BCS-001 is designed to identify the location of the barge overfill alarm system electrical connector. It is 7" x 11" and contains all information required including a space for the system inductance rating in millihenrys and the system capacitance in microfarads. Please furnish this information when ordering and allow 2-3 weeks for delivery. This is a two-sided imprint with black letters on a white background.

CARGO SIGN - CGS-XXX

Made from powder-coated aluminum. These signs are 4" x 32" with the cargo name screen-printed in 2" high letters and the three-letter CHRIS code in 3" high letters. Designed to attach with stainless steel split rings to the top-mounted auxilliary sign platform on our DCA-001. These signs are one color (black letters on white background) with imprint on both sides. SUGGESTION: When ordering signs for four or more cargos for the same barge - order one extra sign and we can preassemble your cargo signs in sets that can be conveniently flipped so that they display the same cargo designator from either port or starboard (this is accomplished by leaving one side of two of the signs blank, thus necessitating one additional sign). We stock the 30 most popular cargo signs and are adding more all the time. If you are requesting a cargo desiginator that we do not have in stock, please allow 2-3 weeks for delivery. To order - fill in the 3 letter CHRIS code desiginator after "CGS-" in the part number and use CGS-xxx for your extra sign, if ordering pre-assembled sets.

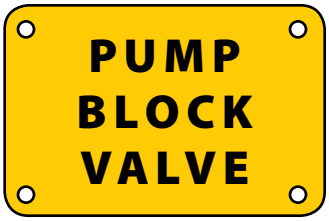
CARGO INFORMATION CARD
CIC-XXX

7" x 11" powder-coated aluminum. Designed to securely attach with stainless steel rings to the side-mounted auxilliary sign platform on our DCA-001. These signs are printed two colors (white background with black letters and bright red border highlights) imprinted on both sides. SUGGESTION: When ordering signs for four or more cargos for the same barge-order one extra sign and we can pre-assemble your cargo information cards into sets that can be conveniently flipped so that they read the same CHRIS Code information from either port or starboard. We stock the 30 most popular cargo signs and are adding more all the time. If you are requesting a cargo desiginator that we do not have in stock, please allow 2-3 weeks for delivery. To order - fill in the 3 letter CHRIS Code designator after the "CIC-" in the part number.

FILL/SUCTION VALVE SIGN

FSV-001

PUMP BLOCK VALVE SIGN



PBV-001

7" X 11" Black letters on Yellow background, 1 Sided. Pre-drilled for easy mounting.

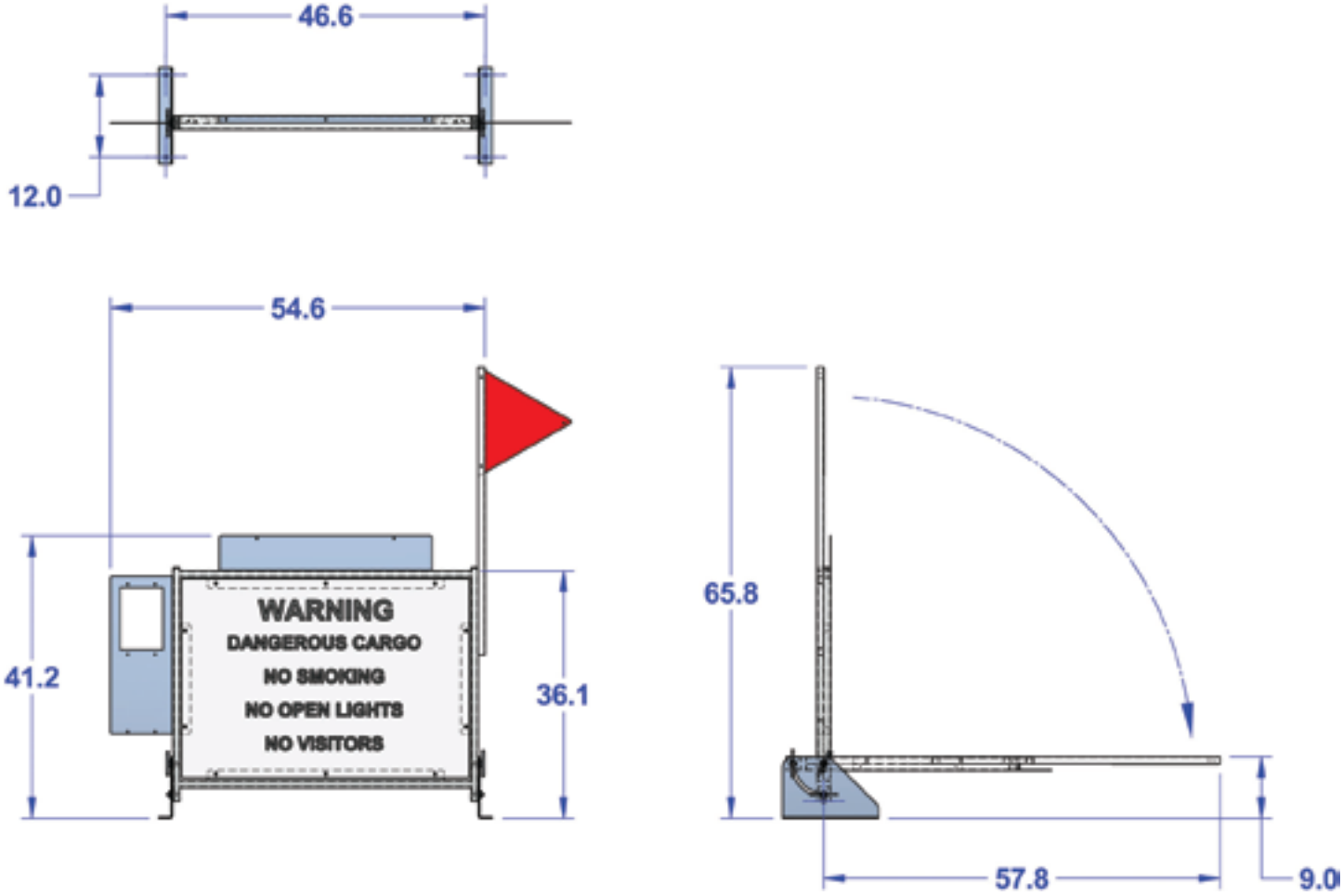
EMERGENCY NOTIFICATION SIGN NOT-001
This sign is custom made for your company's barges on powder coated aluminum for optimum durability. The standard format is 7" X 11" one color (blackletters on white background) and screened two sides with predrilled mounting holes. However, we can add a second color, or your company logo for a nominal charge.

ULLAGE GAGE LOCATION SIGN - ULG-001
Formed with a 1-1/2" lip on the bottom (pre-drilled with two 1/4" holes) for easy and quick mounting. The information area is 9-1/2" x 7" and is a two sided imprint with blue letters on a white background.

EMERGENCY SHUTDOWN SIGNS EMS-002
Made from aluminum with tough baked-on bright red enamel. Both have white letters. EMS-001 is 4" x 32" printed on one side only and pre-drilled with two 1/4" holes. EMS-002 is a 14" square sign printed on two sides and pre-drilled with 1/4" holes at each corner.

EMF-001
This rugged frame is made to hold the EMS-002 and weld or bolt securely to your deck. Stainless steel sign mounting and frame assembly hardware is included.

DCA-001 & BNZ-001 SIGN MOUNTING DIMENSIONS



REGULATORY SIGN PROGRAM - ORDERING INFORMATION

PART NUMBER	DESCRIPTION	All Items UPS Shippable
DCA-001	"Dangerous Cargo" Sign Package - Includes: Sign, Frame, Red Pennant (with pole), Mounting Platforms for Cargo Information Cards, Emergency Notification Sign, Cargo Signs and Mounting Feet. (CIC-xxx. CGS-xxx and NOT-001 not included - order separately).	
DCA-002	"Dangerous Cargo" - SIGN ONLY - 2 sided, 1 color. Black letters on white background (29" x 42" aluminum) pre-drilled.	
BNZ-001	"Danger - Benzene" Sign Package includes Sign, Frame, and Mounting Feet. Black enamel finish is standard on sign frame. Optional galvanized finish available.	
BNZ-002	"Danger - Benzene" - SIGN ONLY - 2 sided, 1 Color. Black letters on white background (29" x 42" aluminum) pre-drilled.	
PNT-001	Red pennant with mounting pole & lantern hook.	
CGS-xxx	Cargo Signs - 4" x 32", 2 sided, 1 color. Black letters on white background. Pre-drilled (specify three letter CHRIS Code).	
CIC-xxx	Cargo Information Cards - 7" x 11", 2 sided, 2 colors. Red & Black on White background, pre-drilled (specify three letter CHRIS Code).	
ULG-001	"Ullage Gauge Here" Sign - 7" x 11", Pre-formed mounting lip and pre-drilled. 2 sided, 1 color. White letters on blue background.	
CRV-xxx	"Cargo Valve #_" Signs - 4" x 6", 1 sided - 1 Color. Black on Yellow, If applicable, specify cargo tank number and port or starboard.	
EMS-001	"Emergency Shutdown" Sign - 4" x 32" horizontal layout, 1 sided, 1 color. White letters on red background. Pre-drilled.	
EMS-002	"Emergency Shutdown" Sign - 14" x 14" square layout, 2 sided, 1 color. White letters on red, background. Pre-drilled.	
EMF-001	Mounting frame for EMS-002, with mounting feet. Black painted finish standard.	
NOT-001	"In Case of Emergency" - 7" x 11", 2 sided, 1 color. Black letters on white background. Pre-drilled. This is a custom sign - please allow 3-4 weeks for delivery. Set up charge applied for quantities less than 25 signs.	
BCS-001	"Barge Connector" Sign - 7" x 11", 2 sided, 1 color. Blue letters on white. SPECIFY: System Inductance in Millihenrys and System Capacitance in Microfarads. Allow 2-3 weeks for delivery.	
PBV-001	"Pump Block Valve" - 7" x 11", 1 Sided, 1 color. Blue letters on Yellow.	
FSV-001	"Fill/Suction Valve" - 7" x 11", 1 Sided, 1 color. Black letters on Yellow.	

SECTION 06

FABRICATION PRODUCTS

DRIP PANS

- **FULL REGULATORY COMPLIANCE**
  ERL Drip Pans satisfies 33 CFR 155.310 for containment of Oil and Hazardous material cargo discharge.

- **HEAVY DUTY CONSTRUCTION**
  All ERL Drip Pans can be custom made to fit your requirements. Drip pan covers are typically constructed out of 300 series stainless steel and the grating and body can be constructed out of carbon or stainless steel depending on customer preference.

  ERL can supply customized drip pan covers and grating. Covers are typically constructed from 300 series stainless steel and grating can be stainless steel, carbon steel, or galvanized. All that is needed for ordering is customer drip pan dimensions and style of cover (one piece, two piece, or sliding style construction).

Ordering Dimensions:
- Cover Material _____
- Grating Material _____
- Body Material _____
- Number of Barrels _____ bbl
- Height _____in
- Length _____in
- Depth _____in
- Leg Height _____in
- Coupling Size _____in

VENT STACK

Top section of Vent Stack containing Flame Screen

- **FULL REGULATORY COMPLIANCE**
  ERL Vent Stacks satisfies the requirements of 46 CFR Subpart 32.55 – Ventilation and Venting and includes a 30 X 30 316SS mesh Flame Screen which complies with U.S. Coast Guard Regulations 46 CFR part 39, Paragraph 39.20-3 (a).

- **100% STAINLESS STEEL**
  All ERL Vent Stacks are constructed from 304 Sch 10 stainless steel ensuring extended service life and a reduced need for maintenance. The top of the Vent Stack contains a replaceable 30 X 30 316SS Mesh allowing for optimum resistance to flame propagation.

- **MAINTENANCE AND OPTIONS**
  Since the ERL Vent Stacks are constructed from 300 series stainless steel it reduces the need for maintenance and the top section of the Vent Stack is easily disassembled for complete inspection and replacement of the internal flame screen. ERL offers swivel or ridged mount and the body can be produced from either 8" or 10" 304 sch 10 stainless steel.

ERL Vent Stack Collapsible - mounted on swivel flange.

LADDERS

Standard 3 Rung Ladder

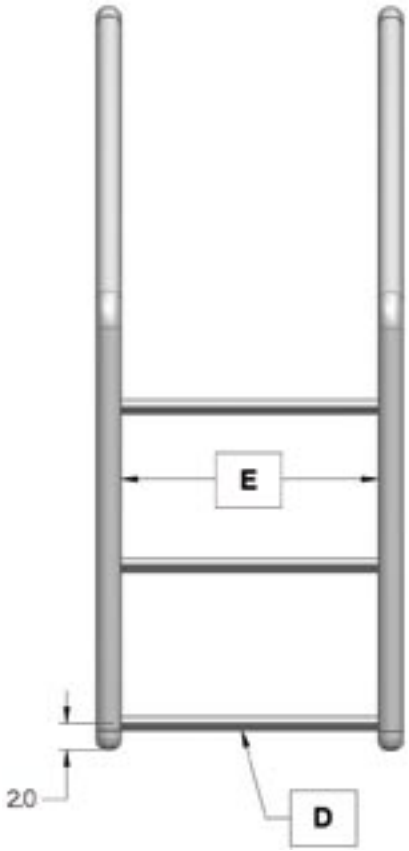
Stainless Steel Ladder - 5 rung

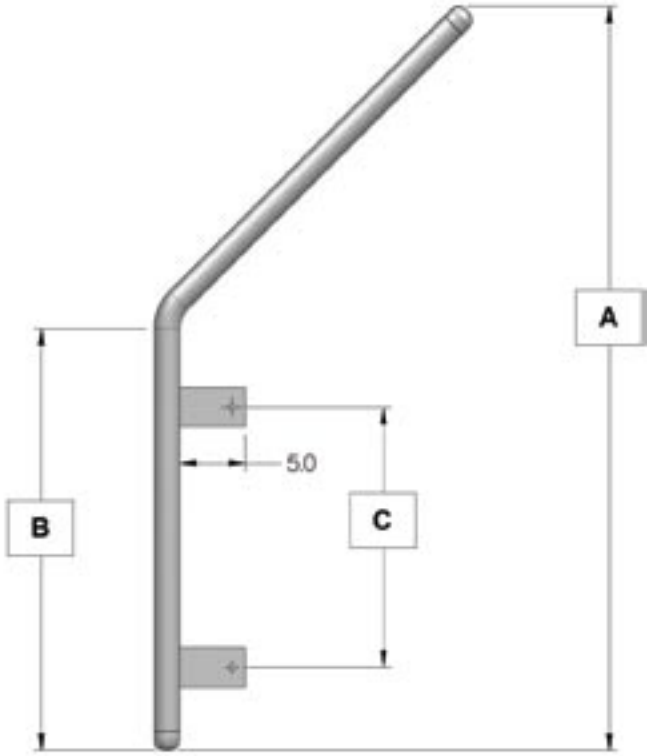
- **100% STAINLESS STEEL**
  ERL's Barge Ladders are manufactured from 300 series stainless steel ensuring sturdy construction as well as extended life of the product while in the field. ERL's standard Ladder is a 3 rung ladder with a 45° degree angle towards the top with steps spaced 12" apart.

- **MATERIALS & MANUFACTURING**
  All ERL Ladders are constructed from 1-1/2" 300 series sch 40 stainless steel pipe for the sides and ¾" 300 series stainless steel square bar for the steps or rungs. ERL's standard 3 rung ladder measures 72" overall height with a 45° degree angle and the distance between brackets measuring 24.5" hole to hole. Supplied with 5/16" thick Mild Steel Mounting Clips.

- **CUSTOMIZE**
  ERL can custom build any ladder per customer requirements. Please refer to Ordering dimensions chart for required measurements.

LADDERS





Ordering Dimensions:

A = Overall Height
B = Length of Rail upright section
C = Hole to Hole distance between brackets
(standard dim. = 19.75)
D = Number of Rungs required
E = Length of Rung

FUEL TANKS

300 Gallon Fuel Tank

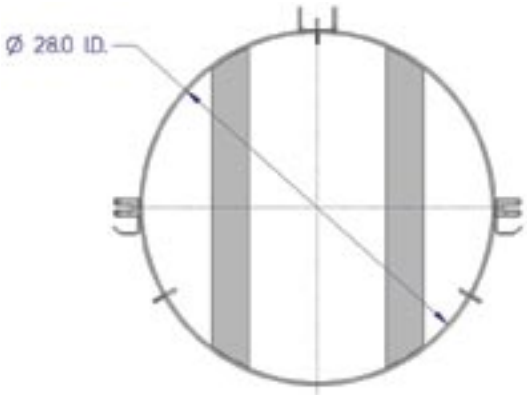
- **FULL REGULATORY COMPLIANCE**
  All ERL fuel tanks are constructed from ¼" carbon steel and are welded solid. ERL tests each Fuel Tank prior to shipment. Our standard 300gal Fuel Tank is tested to 6PSI Press. All construction on ERL fuel tanks satisfies 46 CFR 58.50-10 – Diesel Fuel Tanks.

- **MATERIALS & MANUFACTURING**
  All ERL 300 Gal Fuel Tanks come standard with a 2" - 90° degree elbow fitted to a 2" – 150# stainless steel flange. They also contain a 2" carbon steel Fill pipe, and a 2.5" carbon steel Vent pipe that contains a replaceable 316 stainless steel flame screen. On the top of the Fuel Tank there is an 8" Ullage hatch fitted with an 8"- 316 stainless steel flame screen. On the base of each Fuel Tank ERL adds ½" carbon steel mounting brackets allowing for easy mounting and removal of the tank. There is a stainless Data Tag with serial identification and the date the tank was made.

NOTE: Other sizes are available. Please contact ERL with any inquires concerning any additional size requirements.

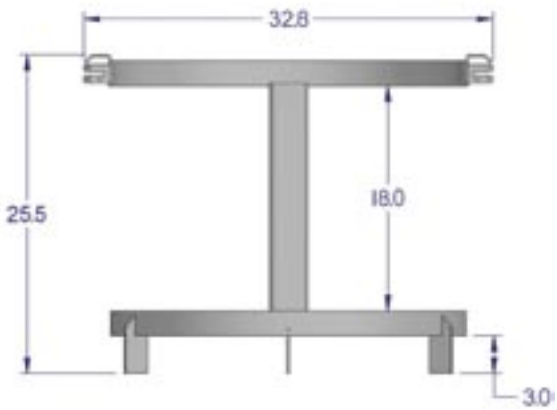
BARGE SPILL KIT RACK

ERL Standard 95gal Spill Kit Rack



- **FULL REGULATORY COMPLIANCE**
  US Department of Transportation 33 CFR part 155 – Discharge Removal Equipment Regulations for Oil Carrying Vessels requires that oil carrying vessels in US waters have oil spill clean up equipment on board for deck spills. ERL's Spill Kit Racks ensure a safe, secure, and easy way to store your Spill Kits on the deck of a barge or boat.

- **MATERIALS & MANUFACTURING**
  ERL Spill Kit Racks are produced from ¼" X 2" precision laser cut carbon steel material and are formed and welded to ensure a quality product that will last. Each Spill Kit Rack comes complete with a 3/16" galvanized chain containing springs for added tension. Five Safety seals with a breaking force of 6lbs ensure your Spill Kit will be secure and tamper free. Three feet on the base of the Spill Kit Rack allows for easy welding or mounting to any deck surface.



MARINE SCUPPER PLUGS

- **FULL REGULATORY COMPLIANCE**
  ERL's Scupper Plugs help to ensure your barge meets regulatory compliance of 33 CFR 155.205 – Discharge Removal Equipment for Vessels. Regulations requires that oil tankers and offshore oil barges with an overall length of 400 feet or more must carry appropriate equipment and supplies for the containment and removal of an on-deck oil cargo spills of at least 12 barrels.

- **MATERIALS & OPERATIONS**
  All ERL Scupper Plug are constructed from forged EPDM material allowing for superior quality as well as extended product life while in the field. Each Scupper plug comes standard with a bronze hex nut and stainless steel lanyard for to ensure a secure fit. ERL can also offer a bronze wing nut if preferred. For in stock available sizes please refer to the item list. ERL can offer other sizes if desired.

Item #	Description
Scupper Plug 1.875-N	1.875" Scupper plug w/Lanyard and Bronze Hex Nut
Scupper Plug 2.0-N	2.0" Scupper plug w/Lanyard and Bronze Hex Nut
Scupper Plug 2.2-N	2.2" Scupper plug w/Lanyard and Bronze Hex Nut

Bronze Wing Nut is offered as an option.

DOCUMENT BOXES

Side Door Pipe Mount

- **100% Stainless Steel Construction**
  ERL Stainless Steel Document box is offered in three different styles. They are constructed from 300 series stainless steel and the Side Door Pipe Mount is weather sealed to ensure complete protection from all external conditions. ERL welds are passivated so that the box has better resistance to corrosion and looks nicer on your barge.

  ERL can also custom design a document box according to your needs.

Standard Sizes	
Top Door (TDPM/TDFR)	**Side Door** (SDPM)
Material – 304 SS Dimensions – 17.68" X 13.18" X 6.12"	Material – 304 SS Dimensions – 15.56" X 12.87" X 12.06"

Top Door Mount with
External Mounting Feet

FIRE EXTINGUISHER HOLDERS

- **100% STAINLESS STEEL CONSTRUCTION**
  The ERL Fire Extinguisher Holders allow for safe and secure storage for on deck fire extinguishers. Each holder is constructed from 300 series stainless steel and is welded and bolted allowing for easy usage.

- **EASE OF OPERATIONS**
  A stainless steel latch with rubber pads are across the front of the holder ensures a secure fit while allowing for easy access when needed. Across the back of the Holder, ERL has added two formed brackets with rubber pads welded into position which helps to eliminate movement. ERL welds are passivated so that the bracket has better corrosion resistance and looks nicer on your barge.

- **FIRE EXTINGUISHER BRACKET**
  ERL also offers an economical all stainless steel fire extinguisher bracket that is manufactured for easy use and mounting.

Item #	Extinguisher Size	Fire Ext. O.D.
FEH #5	10lbs	5″
FEH #7	20lbs	7″
FEH #8	25lbs	8″

Fire Extinguisher Bracket

ERL HOSE RACK

- **100% STAINLESS STEEL**
  The ERL Standard and W-Style Hose Racks provide a convenient and compact storage system for a collapsible hose. It is constructed from 300 series stainless steel which ensures extended product life as well as durability for continuous use if the field. Both the W-Style and Standard style hose rack comes with mounting brackets which allow the product to pivot out of the way when not is use. All welds are passivated for corrosion resistance and attractive looks.

  The ERL Saddle Type Hose Rack provides convenient packaging and storage for all types of hoses. Each ERL Saddle Type Hose Rack is constructed from 300 series stainless steel to ensure extended product life and it's welded construction provides durability for continuous use in the field.

  ERL offers four different sizes for the Saddle Type Hose Rack. A rack for 50' or 100' of 1.5" or 2.5" hose. All can be easily mounted by the 2 holes in the support bar. All welds are passivated for corrosion resistance.

W-STYLE AND STANDARD SIZES

1.5" Style
2.5" Style

*** NOTE: Size refers to the diameter of the hose.**

STANDARD STYLE HOSE RACK

AIR BOX DRAIN CANISTER

- **100% STAINLESS STEEL**
  ERL offers an Air Box Drain Canister for Detroit Diesel Engines manufactured for collection of engine blow back. The entire unit is constructed out of 300 series stainless steel and all welds are passivated to ensure an attractive product that will withstand the hardships of the barge environment.

- **EASY OF OPERATION**
  The ERL Air Box Drain Canister comes complete with stainless steel rubber lined mounting brackets to ensure a safe a secure fit onto any Detroit Diesel Engine. The Canister has two ¼" NPT threaded fittings allowing for easy attachment of the drain hoses as well as a stainless steel, ¾" NPT vent and drain to help minimize any pressure or overflow that may build up during operation.

TELESCOPIC PEEP LIGHT


Cordless Peep Light


Peep light with Cord

- **OPERATION & MANUFACTURING**

The ERL Telescopic Peep Light is a simple and well designed operational product constructed from 5052 Triangular shaped Alum. Due to the material and construction, it is easily transported and it's rugged design ensures a lasting product life.

The split collar for the 1.72" light is rubber lined to ensure a safe and secure fit. The foot of the Peep Light is 4" dia X .25" thick 5052 Alum. The Peep Light stand contains a tri-style tie down bracket with three .50" holes for anchor ropes. Eyelets along the side are .125" 5052 Alum and are lined with rubber grommets to help protect the cord. ERL also offers a cordless model for a McDermott (NA167436) light powered by 4-AA Batteries.

- **ADJUSTABLE HIEGHTS**

Lowest setting = 82.75" tall
Second setting = 125.50" tall
Third setting = 165.75" tall
Highest setting = 201.50" tall

SECTION 07

REFERENCE INFORMATION

CARGO GRADES

CONVERSION TABLES

MARINE TERMS AND DEFINITIONS

CARGO GRADES

The Grade classifications assigned by the U.S. Coast Guard to FLAMMABLE or COMBUSTIBLE liquids are defined as follows:

GRADE A	**Flammable liquid with a Reid vapor pressure of 14 pounds per square inch absolute (PSIA) or more.**
GRADE B	**Flammable liquid with a Reid vapor pressure of more than 8-1/2 psia but less than 14 psia.**
GRADE C	**Flammable liquid with a Reid vapor pressure of 8-1/2 psia or less and a flash point of 80°F or below.**
GRADE D	**Combustible liquid with a flash point above 80°F but below 150°F.**
GRADE E	**Combustible liquid with a flash point of 150°F or above.**

RELEVANT DEFINITIONS

Reid Vapor Pressure: Equilibrium exerted by vapor over liquid at 100°F, expressed as pounds per square inch absolute (PSIA) as defined in 46 CFR 30.10-59.

Vapor Density: This is actually a specific gravity rather than a true density because it equals the ratio of the weight of a vapor or gas (with no air present) compared to the weight of an equal volume of air at the same temperature and pressure. Values less than 1 indicate that the vapor or gas tends to settle. However, temperature effects must be considered.

Flash Point: The lowest temperature at which the vapors of a liquid may be ignited momentarily. Values given in the data sheets are open cup except when designated "(cc)," which indicates the closed cup value. In general the open cup value is about 10° to 15°F above the closed cup value.

Flammable Limits: The range of gas or vapor concentrations (percent by volume in air) which will burn or explode if an ignition source is present. Limiting concentrations are commonly called the "lower explosive limit" (LEL) and the "upper explosive limit" (UEL). Below the LEL the mixture is too lean to burn, and above the UEL, the mixture is too rich to burn.

CONVERSION FACTORS

Metric Units Used In Part 153

Parameter	Metric (SI unit)	Abbreviation	Equilvalent to English or common metric
Force	Newton	N	0.225 lbs.
Length	Meter	m	39.37 in.
	Centimeter	cm	.3937 in.
Pressure	Pascal	Pa	1.450 x 10-4 lbs/in².
	Kilo-Pascal (1,000 Pascals)	kPa	0.145 lbs/in2 .
	Kilo-Pascal	kPa	1.02 x 10-2 kg/cm².
	do	kPa	1 X 103 N/m².
Temperature	Degree Celsius	°C	5/9 (°F-32).
Viscosity	milli-Pascal second	mPa.sec	1.0 centipoise.
Volume	Cubic meter	m³	264 gallons (gal).
	do	m³	35.3 ft³.

"RULE OF THUMB"

Specific gravity of water:
fresh = 1.00
salt = 1.025 (approx.)

VISCOSITY

Centistokes x density (grams per ml.) = centipoises
Kinematic viscosity x density = absolute viscosity

DENSITY

Pound per gal. (U.S.) at 20°C = specific gravity at 20/20°C x 8.32162
Pound per gal. (U.S.) = 0.119826 grams per ml.

TEMPERATURE CONVERSIONS

Fahrenheit to Celsius C = (F - 32) x .556
Celsius to Fahrenheit F =(C x l.8) + 32

MISCELLANEOUS CONVERSION FACTORS

Given this,	multiply by this,	to get this.
atmosphere (atm)	760	mmHg (at O°C)
	29.92	in. Hg (at O°C)
	33.899	ft H20 (at 4°C)
	1.0333	kg/cm ²
	14.69	lb/in.2
	1.0133	bar
	101.3	kPa
bar	0.987	atm
	750	mm Hg (at O°C)
	14.5	lb/in.²
	100	kPa
barrel (U.S. liq.) (bbl)	26.229	gal (Brit)
	31.5	gal (U.S.)
	119.237	liters
	4.2109	ft³
barrel, petroleum	42	gal (U.S.)
foot, H20 (at 4°C)	0.0295	atm
	0.883	in. Hg (at O°C)
	2.2419	cm Hg (at O°C)
	0.4335	lb/in.²
	304.79	kg/m²
foot	3 0.02832	m³
	28.316	liters
	7.4805	gal (U.S.)
	6.2288	gal (Brit)
gallon, U.S. (gal)	0.8327	gal (Brit)
	128	oz (U.S. liq.)
	8 pt	(U.S. liq.)
	4 qt	(U.S. liq.)

CONVERSION FACTORS

Given this,	multiply by this,	to get this.
gallon, U.S. cont.	3.785	1iters
	0.1337	ft^3
	8.328	lb fresh H20 (freshwater at 60°/F)
	8.336	lb fresh H20 (fresh water at 4°C)
	0.0317	bbl (U.S.liq.)
	0.0238	bbl (petroleum)
gallon, British	1.2009	gal (U.S.)
	4.546	liters
	160	oz (Brit liq.)
	0.16054	ft^3
	10 lb	H20 (at 60°F)
gallon/minute (U.S.)	8.0208	ft^3/hr
	0.06309	liters/sec
gram (g)	0.001	kg
	0.0353	oz (avoir.)
	0.0022	lb
gram/liter (g/l)	1 000	ppm
	0.008345	lb/gal (U.S.)
	0.0624	$lb.ft^3$
kilogram/meter^2 (kg/m^2)	0.07356	mm Hg (at O°C)
	0.00142	$lb/in.^2$
	0.000097	atm
	0.20482 l	b/ft^2
kilogram/meter^3 (kg/m^3)	0.06243	lb/ft^3
kilopascal (kPa)	0.14503774	$lb/in.^2$

CONVERSION FACTORS

Given this,	multiply by this,	to get this.
litercont.	0.001	m^3
	0.2642	gal (U.S.)
	0.21998	gal (brit)
	1.0567	qt (U.S. liq.)
	0.8799	qt (Brit liq)
1iters/min/ (1/min)	0.035316	ft^3/min
	0.264179	gal (U.S.)/min
meter³ (m^3)	35.315	ft3
	264.172	gal (U.S.)
	219.969	gal (Brit)
	1000	liters
millimeter Hg	0.001316	atm
	0.001333	bar
	1.3595	g/cm^2
	0.0193	$lb/in.^2$
	1	torr
ounce (avoirdupois)(oz)	28.35	g
ounce (U.S.liq.)	29.5737	cc
	0.0296	liters
	0.032	qt
ounce (Brit liq.)	28.413	cc
pint (U.S.liq.)	473.176	cc
	0.473163	liters
	0.5	qt
pound (lb)	453.5924	g
	0.45359	kg
	16	oz (avdp)

CONVERSION FACTORS

Given this,	multiply by this,	to get this.
pound/in.^{2} (lb/in.^{2})	51.715	mm Hg (at O°C)
	703.07	kg/m^2
	0.068046	atm
	0.06895	bar
	70.307	g/cm^2
	6.894757	kPa
pound foot^3 (lb/ft^3)	0.01602	g/cc
	16.018	kg/m^3
quart (liquid)	946.353	cc
	0.94633	liters
	0.25	gal (U.S.)
ton (short)	907.1847	kg
	2000	lb(avdp)
	0.89286	ton (long)
	0.9072	tonne (metric)
ton (long)	1016.047	kg
	2240	lb(avdp)
	1.12	ton (short)
	1.01605	ton (metric)
tonne (metric)	1000	kg
	2204.62	lb (avdp)
	1.1023	ton (short)
	0.98421	ton (long)
torr	0.001316	atm
	1.0 mm	Hg (at O°C)

MARINE TERMS AND DEFINITIONS

ABS - American Bureau of Shipping; a vessel classification agency which also assigns international loadlines.

admeasure - to measure, calculate, and certify, for the purpose of registration, certain dimensions of a vessel as well as its gross and net tons.

affreightment - a contract for the movement of cargo, in which the cargo owner/shipper is neither charterer nor operator of the vessel.

AHP - Above Head of Passes; used with mileage designations on the Mississippi River, the Head of Passes being mile zero.

AIWW - Atlantic Intracoastal Waterway.

anchor billboard - a structure on the deck of a vessel upon which the anchor is mounted when not in use.

anodes - metallic plates which, when attached to the hull of a vessel, decompose due to electrolysis, reducing deterioration of the hull plate.

athwartship - transverse or across a vessel from side to side.

autoignition temperature - the minimum temperature required to ignite gas or vapor without a spark or flame being present. Values given are only approximate and may change substantially with changes in geometry, gas, or vapor concentrations, presence of catalysts, or other factors.

ballast - any substance, other than cargo, which is usually placed in the inner compartment of a vessel to produce a desired draft or trim.

bareboat charter - (demise charter) a form of vessel rental in which the charterer assumes total responsibility for the vessel and its operations as if it was their own.

beam - the breadth of a vessel.

bell suction - the flared open end of a cargo pipeline which is situated at close tolerances to the bottom of a liquid cargo tank.

bilge - the lower inner space of a vessel's hull.

bin - a walled enclosure built on the deck of a barge for the purpose of retaining cargo; also called a pen or cargo box.

bitt - (bollard or timberhead) a single or double post on a vessel or wharf to which lines are tied.

boiling point - the temperature at which the liquid boils, given in °C and °F at a pressure of 760 min Hg, one atmosphere or 14.7 psia. Thus, the boiling point is the temperature at which the vapor pressure is 760 mm Hg, one atmosphere or 14.7 psia.

bollard pull - the static pulling force of a tugboat measured in pounds.

bounding angle - a steel angle used for reinforcement at the junction of two steel plates.

bow - the forward or front end of a vessel.

boxed end - the end of a barge which is squared for the full depth and width of the hull.

bridle - a V-shaped chain, wire, or rope attached to a vessel being towed to which the towline is connected.

buck frame - a transverse truss.

bulkhead - an upright partition separating compartments.

MARINE TERMS AND DEFINITIONS

bulwark the side of a vessel which extends above the upper deck.

buoy - a stationary floating object used as an aid for navigation.

butterworth - a washing process used to gas free or clean a cargo tank, employing hot water or chemicals, sprayed through a patented rotating nozzle.

butterworth opening - a deck access opening with bolted cover, designed for butterworth operations.

camber - the upward slope of a vessel's deck, occurring when the centerline is higher than the gunnel.

camel - a pontoon used to fender between a vessel and a wharf.

capstan - a hand or machine powered, vertical, spindle-mounted drum which rotates and pulls lines by winding.

certification - attesting that a vessel has met specific legal requirements by the issuance of various certificates or validation of documents by certain governmental or private agencies.

channel - that portion of a waterway which is naturally or artificially deepened to permit safe navigation within certain limits.

charter party - a contractual agreement between two entities for the purpose of renting, hiring, or leasing the exclusive use of a vessel.

chock - va heavy metal casting through which lines may pass for mooring or towing.

CHRIS code - the three letter designation assigned to every entry in the Chemical Hazard Response Information System.

CIF - cost, insurance, and freight; cost of transportation and insurance to be paid by the seller of goods to the named point of destination.

classification - the certification process as administered by certain international agencies whereby a vessel is designed, constructed, and maintained to an agency's requirements.

cleat - a metal fitting with two projecting horns, around which a rope may be made fast.

clip - a small steel bracket used for securing or reinforcing.

coaming - a watertight, raised framework around an opening in the deck of a vessel.

cofferdam - the space in a vessel between two closely located parallel bulkheads.

coils - a system of small diameter pipes installed inside a liquid cargo tank for the purpose of heating the cargo by means of hot oil or steam.

comehome - a convex curvature of the rake sides of a barge that produces a narrower beam at the headlog than the beam of the hull.

common carrier - a federally licensed company which offers to the general public, under published tariffs, to engage in interstate or foreign transportation of commodities of various types.

compartment - an interior space of a vessel's hull which is formed by bulkheads.

contract carrier - a federally licensed company which offers under individual contracts to engage in interstate or foreign transportation of commodities of various types.

daymark - a marker used as an aid to navigation which is visible in daylight.

MARINE TERMS AND DEFINITIONS

deadrise - the upward slope of a vessel's bottom occurring when the centerline is deeper than the bilge knuckle; provided to facilitate removal of liquid cargo.

deadweight tonnage - the cargo capacity of a vessel.

demurrage - a charge assessed for detaining a vessel beyond the free time stipulated for loading or unloading.

detention - the period of time that an owner or charterer is deprived of the use of his vessel as a result of actions of another party.

docking tug - a tugboat which assists a large seagoing vessel to and from its berth.

documentation - the process of licensing a vessel in either enrollment or registry, resulting in the issuance of a vessel's official document.

dolphin - a cluster of piles driven into the bottom of a waterway and bound firmly together for the mooring of vessels.

doubler - a steel plate installed on an existing structural plate and used as a repair of a damaged area.

draft - the depth of a vessel's keel below the waterline; often expressed as light draft, conversely, loaded draft.

draft marks - the numerical markings on the sides of a vessel at the bow and stem, which indicate, at the lower edge of the number, the amount of water the vessel draws.

drip pan - an open container, located on deck under the ends of a pipeline header to retain cargo drippage. Required on all U.S.C.G. certified tank barges.

drydocking - the removal of a vessel from the water to accomplish repairs or inspections.

dumb vessel - a vessel without means of self-propulsion.

dunnage - any materials used to block or brace cargo to prevent its motion, chafing, or damage and to facilitate its handling.

EHL - East of Harvey Lock; used with mileage designations on the Gulf Intracoastal Waterway, Harvey Lock being mile zero.

ETA - Estimated Time of Arrival.

ETD - Estimated Time of Departure.

expansion trunk - a raised enclosure around an opening in the top of a liquid cargo tank which allows for heat expansion of the cargo.

exposure procedures - first aid procedures recommended by manufacturers and safety organizations. These are emergency procedures only. The victim should be examined by a physician as soon as possible.

fairing - re-forming distorted steel to its original form or shape.

fairlead - a device consisting of pulleys or rollers arranged to permit reeling in of a cable from any direction; often used in conjunction with winches and, similar apparatus.

fender - any device used to absorb and distribute shock and to prevent chafing between a vessel and another object.

fishplate - a triangular-shaped steel plate used to strengthen the connection of the towing hawser.

MARINE TERMS AND DEFINITIONS

flame screen - a corrosion-resistant fine wire mesh screen used to cover certain openings on tank vessels to prevent the passage of flame into the tank.

flammable limits - the range of gas or vapor concentrations (percent by volume in air) which will burn or explode if an ignition source is present. Limiting concentrations are commonly called the "lower explosive limit" (LEL) and the "upper explosive limit" (UEL). Below the LEL the mixture is too lean to burn, and above the UEL it is to rich to burn.

flange - that portion of a steel shape which projects at a right angle to provide strength or a means of attachment to another part.

flash point - the lowest temperature at which the vapors of a liquid may be ignited momentarily. Values given in the data sheets are open cup except where designated "(cc)," which indicates the closed cup value. In general, the open cup value is about 10° to 15°F higher than the closed cup value.

fleet boat - a boat which primarily tends, tows within, or otherwise services a fleeting area.

fleeting area - (fleet) a designated portion of a waterway where vessels are regularly moored and tended.

F.O.B. - Free On Board; cargo delivered to and placed on board a carrier at a specific point without charge.

freeboard - the distance from the waterline to the main deck of a boat or barge.

freeing port - a large opening in the bulward on an exposed deck of a seagoing vessel which provides for the rapid draining of water from that deck.

freezing point - the temperature in °C and in °F at which the liquid solidifies.

fullyfound - a vessel completely equipped and manned for service.

gas free - the process of removing all hazardous gases and residues from the compartments of a vessel.

gasket - an elastic packing material used for making joints watertight.

gauge - a waterway marker which measures the level of the water in foot increments; also refers to the specific measure on the gauge.

GIWW - Gulf Intracoastal Waterway.
gross tons - the volume measurement of the internal voids of a vessel wherein 100 cu. ft. equals one ton.

gunwale - (funnel) that part of a barge or boat where the main deck and side meet.

gusset - a steel plate used for reinforcing or bracing the junction of other steel members.

harbor boat - any powered vessel which is used primarily in harbor operations.

hatch - a removable cover over the cargo hold of a vessel.

hawser - a large circumference rope used for towing or mooring a vessel or securing it at a dock.

headlog - the reinforced, vertical plate which connects the bow rake bottom to the rake deck of a barge or square-stemmed boat.

head of navigation - the uppermost limit of navigation from the mouth of a waterway.

hip towing - (hiping) a method of towing where by the vessel being towed is secured alongside the towboat.

MARINE TERMS AND DEFINITIONS

homeport - the port city which is home base of a vessel or from which it is documented.

horsepower - a standard unit of power which is often classified in connection with engines as brake, continuous, input, intermittent, output, or shaft horsepower.

hull - the main body of a vessel which provides flotation.

ICC - (Interstate Commerce Commission) a U.S. governmental agency which regulates the domestic transportation of certain commodities.

inland waters - considered to be the canals, rivers and lakes and their tributaries, and bays and sounds of the land mass of a country.

integrated tow - a tow of box-ended barges which as a complete unit is raked at the bow, boxed at the intermediate connections, and boxed or raked at the stem.

keel - the lowest structural member of a ship or boat which runs the length of the vessel at the centerline and to which the frames are attached.

keel line - an imaginary line describing the lowest portion of a vessel'shull.

kevel - (caval) a heavy, metal deck fitting having two horn-shaped arms projecting outward around which lines may be made fast for towing or mooring of a vessel.

knot - one nautical mile per hour; used as a unit of measurement in expressing the rate of speed of seagoing vessels and the relative speed of water currents.

landing - an improved waterfront property which facilitates loading, unloading, and servicing of vessels.

lightening hole - a hole cut in a plate or frame to reduce its weight without reducing its strength.

lighter - a vessel, usually a barge, that is used in loading or unloading a ship or in transporting cargo in and around a harbor.

light screen - a structure surrounding a vessel's navigation light so as to shield the light from view at certain points of the compass as required by navigational regulations.

light standard - a structure on a vessel used to hold a navigation light.

limber hole - drain hole near the bottom of a frame or bulkhead.
lines the ropes or cables used on a vessel for towing, mooring, or lashing.

loadline marks - a set of permanent markings on the side of an ocean going or Great Lakes vessel which demotes its maximum legal operating draft under certain specified conditions and which is determined by one of the internationally recognized assigning agencies.

lock - an enclosure on a river or canal, with moveable, watertight gates, through which vessels pass, and proceed from one water level to another by raising or lowering the water within the lock chamber.

logbook - (logs) the official record of the daily operations of a manned vessel, kept in detail by the master.

make-up - the act of final positioning and securing of the vessels that form a tow.

Maltese Cross - (@) A- 1 the designation used by ABS which signifies that a vessel has met the classification requirements of that agency.

MARINE TERMS AND DEFINITIONS

manhole - a framed opening in the deck of a vessel which primarily provides access for a man.

manhole cover - a cover which seals a manhole and is usually designed to lock in place by twisting or using a centerbolt, stud bolts, or dogs.

MARAD - the U.S. Maritime Administration.

marine chemist - one who is certified to perform inspections in accordance with the Standard for the Control of Gas Hazards on Vessels to be repaired as adopted by the National Fire Protection Association.

marine chemists certificate - the documentation of a vessel's inspection by a marine chemist and his assignment of standard safety designations to the inspected compartments or spaces. master the captain of a vessel; the person who has complete charge of and authority aboard an operating vessel.

mats - slabs, usually constructed of timbers, which are placed on the deck of a vessel for the purpose of supporting and distributing the weight of heavy loads.

milemarker - (mileboard) a marker set up to indicate distances in miles along a waterway.

model hull - a type of hull design in which the form is molded, curved, and shaped into a pointed stem and rounded stem.

molded depth - the distance from the top of the keel to the top of the upper deck beams amid ships at the gunwale.

MRGO - Mississippi River-Gulf Outlet; the deep draft waterway connecting the New Orleans Inner Harbor Navigation Canal to the Gulf of Mexico.
nautical mile - a unit of length used in sea navigation equal to 1852 meters or approximately 6076 feet.

navigable waters - those waterways upon which commercial or private vessels are able to operate in their customary mode of navigation.

net tons - the gross tons of a vessel less deductions for certain specified non-cargo spaces resulting in a net volume capacity of 100 cu. ft. per ton. (see gross tons)

OCMI - Officer in Charge of Marine Inspections at a U.S. Coast Guard Marine Inspection office. Such offices are located in a number of U.S. ports.

odor threshold - the smallest concentration, expressed in parts per million (ppm) by volume in air that can be detected by smell by most people. This is not an absolute value. It will vary among individuals and will vary from day to day for any one person. The odor of a potentially dangerous vapor may be hidden by another odor. In addition, certain vapors are likely to produce olfactory fatigue, which is deadening of the sense of smell and alone is not a reliable indicator of the presence or absence of a dangerous vapor.

official number - the registration number assigned by the U.S. Maritime Administration to a U.S. documented vessel and which is permanently marked on the main beam of that vessel.

offshore waters - a common term for those waters which are beyond inland water limits and have the technical classification of "oceans."

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pelican hook - a hinged hook held closed by a ring and used to provide quick release of an object which it holds.

permissible exposure limits - (PEL); Threshold Limit Val. (TLV): the Permissible Exposure Limit and the Threshold Limit Value refer to an airborne concentration of a product expressed in parts per million (ppm) by volume in air. These are the Time-Weighted- Average (TWA) concentrations believed to be safe for the average person during an 8-hour workday and 40-hour workweek for prolonged periods. The susceptibility of individuals will vary.

Plimsoll mark - the primary loadline mark which is a circle intersected by a horizontal line accompanied by letters indicating the authority under which the loadline is as signed.

poisons - some products are classified for regulatory purposes as poisonous liquids. Definitions are given in 49 CFR PART 173, SUBPART D.

port - the left-hand side of a vessel when facing forward; a city having a harbor for vessels, i.e., a port hole.

pv valve - pressure vacuum relief valve, a valve which automatically regulates the pressure or vacuum in a tank.

propeller - a mechanical device having rotating blades which is mounted on a revolving, powerdriven shaft for the purpose of propelling a boat; also called a screw or wheel.

pushboat - a highly maneuverable, inland waters, shallow draft towboat usually designed with a square bow and towing knees which facilitate its primary method of towing, which is pushing.

push knee - (towknee) a vertical, reinforced steel structure installed on a vessel to facilitate push towing. The height of the knee allows for variance in freeboards between vessels.

raised rake - the rake of a barge which has sheer.

rake - the configuration of the square end of a barge or boat in which the bottom slopes upward to meet the headlog or sternlog.

reachrod - a steel rod which connects an above deck valve handle to a below deck valve.

registered - pertaining to certain vessel data calculated under specific rules and officially documented, such as registered length.

reid vapor pressure - equilibrium pressure exerted by vapor over the liquid at 100°F, expressed as pounds per square inch absolute (pisa) defined in 46 CFR 30.10-59.

rubrail - a protective railing on the hull of a vessel which is used for fendering.

Rules of the Road - a code governing vessels as to the lights to be carried, the signals to be made, and their safe and proper navigation in order to avoid collisions. Statutes of the United States provide varying regulations for three areas of navigation. These regulations are known as Western River Rules, Inland Rules, and International Rules.

MARINE TERMS AND DEFINITIONS

running lights - those lights required to be shown at night aboard a vessel or a tow while underway.

sailing line - the preferred course for safe and efficient navigation in the channel of a water way.

scow - another term for a deck cargo barge having a hull design of a flat bottom, square ended rakes, and usually with a deck cargo bin.

scupper - a drainage opening cut flush with the deck of a vessel through the bulwark or bin wall.

seaworthy - the reasonably staunch, sound, and fit condition describing a vessel's capability to safely carry its cargo and complete its intended voyage or use.

semi-integrated barge - a barge which is raked at one end and boxed at the other end.

shackle - a u-shaped metal fitting used as a connection for line, cable, or chain and which has a pin secured through its end by a nut, cotterpin, or screw threads.

sheer - the upward curvature or angle of a vessel's deck at the bow or stern.

shifting - the short movement or transfer of a vessel within a harbor or mooring area.

short exposure tolerance - vapor concentration, expressed as parts per million (ppm) by volume in air, which should not be exceeded for the exposure times specified. Other exposure information obtained from sources believed to be reliable is included. In many cases little or no data on human exposure are available.

skeg - (skag) a framed steel plate structure which acts as a fixed rudder under the stern rake of a barge; also, the after part extension of a boat's keel upon which the rudder rests.

slopesheet - the sloped vertical steel plate forming the end of the hopper barge cargo compartment and which is part of the rake bulkhead.

specific gravity - this is the ratio of the weight of a volume of the cargo to the weight of an equal volume of water. In the case of liquids of limited solubility, the specific gravity will predict whether the product will sink or float on water; for example, if the specific gravity is greater than 1, the product will sink, and if the specific gravity is less than 1, the product will float.

sponson - an addition to the side of a vessel that is outside its normal hull and which provides added deck space and/or greater flotation stability.

spud - a steel or wooden post or pile that is placed vertically through a well in the hull of a vessel and which, when lowered to the bottom of the waterway, anchors the vessel.

spudwell - a casing which is attached to or passes through the hull of a vessel through which a spud is raised or lowered.

starboard - the right-hand side of a vessel when facing forward.

steamboat ratchet - a sleeve, internally threaded at the ends and with attached eye-rods, equipped with a ratchet used to turn the sleeve, thereby pulling the rods towards each other.

stem - the main vertical structural member which forms the foremost part of a boat's model bow.

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stern - the after or rear end of a vessel.

sternlog - the reinforced, vertical shell plating which connects the stern rake bottom to the rake deck of a barge.

strake - a longitudinal or transverse row of steel hull plates.

superstructure - the structural part of a boat above the main deck.

survey - a critical examination or inspection of a vessel, cargo, or marine structure for the purpose of ascertaining desired facts and conclusions when necessary.

survey, condition - determines in some detail the specific condition of a vessel or of cargo; usually performed at the commencement or termination of charters or voyages for the agreed mutual benefit of various parties.

survey, damage - determines the exact extent of damages incurred and specifies repair requirements.

survey report - the written evidence of the survey.

survey, suitability - determines whether a vessel and its equipment are capable of adequately and safely performing an intended task.

survey, trip and tow - a survey in which the surveyor has full responsibility for inspecting and approving the suitability of the towing vessel, its gear and its tow, the loading and lashing of the cargo, and the navigational procedures, all in relation to the trip intended.

survey, valuation - determines the current market value and may also express replacement value.

surveyor - a qualified marine inspector who performs surveys.

tank - an enclosed space used for holding liquids.

time charter - a contract for the services of a vessel for a specified period of time during which the primary control and management of the vessel remain with the owner.

tow - to push or pull vessels on a waterway; also refers to the unit comprised of the towing vessel and the vessels being towed or only the vessels being towed.

towboat - any powered vessel which is used for towing.

transom - the hull plate and its framing that form the vertical end of a box-shaped barge; also, the framed plate forming the stem of a square-ended boat.

truss - a rigid framework of horizontal, vertical, and diagonal structural members designed to support loads and reinforce a vessel's hull.

tugboat - a model hull towboat of relatively deep draft used primarily for pull towing and designed for navigation in open or unprotected water.

turnbuckle - a connection device usually used with cable or chain and which takes up slack by rotating on its screw threads.

ullage opening - a small, covered opening in the top of a cargo tank through which measurements are made to determine the level of the liquid in the tank.

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U.S.C.G. - The United States Coast Guard

vapor density - this is actually a specific gravity rather than a true density because it equals the ratio of the weight of a vapor or gas (with no air present) compared to the weight of an equal volume of air at the same temperature and pressure. Values less than I indicate that it tends to settle. However, temperature effects must be considered. For example, although methane at 68°F has vapor density of 0.55, it becomes more dense at lower temperatures. At -259°F, the boiling point, the vapor is heavier than air. Vapors from an open container of boiling methane fall rather than rise.

vapor pressure - the equilibrium pressure of the saturated vapor above the liquid, measured in millimeters of mercury (760 mm Hg = 14.7 psia) at 20°C (68°F) unless another temperature is specified.

VCG - Vertical Center of Gravity; an important computation used in the determination of the stability of a vessel with its cargo.

VTC - Vessel Traffic Control; a central control system used in some ports to safely direct navigation.

watertight - of such construction or fit as to prevent the passage of water, except when structural discontinuity, physical rupture, or purposeful opening may occur.

wheel - another term for propeller; also, a boat's steering wheel.

WHL - West of Harvey Lock; used with mileage designations on the Gulf Intracoastal Waterway, Harvey Lock being mile zero.

WQIS - Water Quality Insurance Syndicate; an underwriting agency formed by various insurance companies for the purpose of insuring against losses resulting from water pollution.

NOTE: The preceding terminology is defined as it is used in the shallow draft boat and barge industry in the United States. For complete information regarding requirements or regulations of governmental or private agencies, we recommend direct contact with those agencies.

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